SMITHSONIAN REPORT MAR 12 1890

THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LII.—No. 10. Whole No. 770. | NEW YORK, MONDAY, MARCH 10, 1890. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y. AS SECOND CLASS MATTER.

Published on each Monday of the year, at No. 42 Pine Street, N.Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post-office order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

Collections are invariably made directly from this office, for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICES—
Southwestern Gas Association 313
Ohio Gas Light Association 313
EDITORIALS—
Briefly Told 314
The Meeting at Dallas, Tex.—The Latest Gun from Toledo—The Slater and Parker Papers—Electric Light Installations, etc.
Facts and Figures Connected with the Installation and Operation of an Electric Light Plant, by John J. Power 314
Sulphate of Ammonia as Manure 315
Twentieth Annual Meeting, New England Association of Gas Engineers—Official Report, Revised by the Secretary—Continued from page 286 316
First Day, Morning Session: Revivification of Oxide of Iron, by Waldo A. Learned—Discussion—Some Experiments in the Photometer Room, by N.W. Gifford—Discussion. First Day, Afternoon Session: Difference in the Eastern and Western Methods of Management of Gas Works, by E. G. Pratt—Why I shall Make Water Gas, by A. B. Slater—A Few of the Advantages of Water Gas over Coal Gas for Small Works by F. H. Parker—Joint Discussion—Various Methods of Introducing Gas Stoves, by H. A. Norton—Discussion—Management of a Small Gas and Electric Light Plant, by S. J. Fowler—Discussion—Election of Officers—World's Fair Committee—Badges—Printing the Papers—News from the Absent Secretary.
ITEMS OF INTEREST FROM VARIOUS LOCALITIES 327
A 6 Per Cent. Dedham Stock—And a Moral Therefrom—Obituary Note, Dr. H. H. Button—In the Matter of Baltimore's Gas Supply—Notable Engineering Feat—The Dogs to be Asphyxiated—The Story of a Meter—Altering the Massachusetts Carbonic Oxide Laws—Sale of the Crawfordsville (Ind.) Plant—In Control at Media, Pa.—Destruction of the Freeport (Ills.) Company's Electric Annex—Sale of the Indianapolis Plants—They may Rebuild—Opposition Works, St. Joseph, Mo.—Explosion at the Tacony Fuel Gas Works—Public Lighting, Troy, N. Y.—And Many Other Items.
Coke Brick for Furnace Linings 329
Recent Patent Issues 329
The Market for Gas Securities 330

[OFFICIAL NOTICE.]

Southwestern Gas Association.

OFFICE OF SECRETARY, GALVESTON, TEXAS, Feb. 24, 1890.

The annual meeting of the Southwestern Gas Association will be held in Dallas, Texas, March 12 and 13, 1890. The arrangements for the meeting are now being perfected. Headquarters will be at the Windsor Hotel.

C. P. RUSSELL, Sec'y.

[OFFICIAL NOTICE.]

Ohio Gas Light Association.

OFFICE OF SECRETARY,
COLUMBUS, O., February 22, 1890.

To Members of the Ohio Gas Light Association:

Gentlemen—As previously announced, the Sixth Annual Meeting of this Association will be held at Toledo, O., beginning at 10 A.M., March 19, 1890, and continuing two days. Boody House will be the headquarters of the meeting, the various sessions of which will be held in a very suitable room in the same hotel. Members and others desiring to attend are advised to write well in advance for rooms.

The following papers have been promised for the meeting:

1. "Theory and Practice in Gas Management," J. M. Bate, Supt. Gas and Coke Company, Canton, O.
2. "Municipal Control of Lighting," H. Wilkiemeyer, Supt. Gas Light and Coke Company, Portsmouth, O.
3. "Combination of Gas and Electric Lighting in a Small Town," George W. Bowers, Sec. Gas and Electric Light Company, Hillsboro, Ohio.
4. "Our New Coal Gas Works," G. A. Hyde, Engineer Gas Light and Coke Company, Cleveland, O.
5. "Advantages of a Combined Coal and Water Gas Plant," Geo. Light, Asst. Supt. Gas Light and Coke Company, Dayton, O.
6. "Another Year with Fuel Gas," Chas. H. Evans, Manager National Gas Company, Jackson, Mich.
7. "Ohio Street Lighting Statistics," W. C. Hedges, Secretary Gas Light Company, Mansfield, O.
8. "Graduated *versus* Uniform Rates," Chas. R. Faben, Jr., Supt. Gas Light and Coke Company, Toledo, O.

The following questions have been proposed for the "Question Box:"

1. At what point in the works is the best place for the exhauster?
2. In a lighting territory covered by illuminating gas and the incandescent electric light, which seems to be in the ascendency?
3. Does a fine gas of 23 to 25-candle power help check the invasion of the incandescent electric light?
4. Should we not confine the work of our Association to the important interest it was established to promote, viz.: gas lighting and the manufacture of coal gas?
5. What system of electric lighting is best for adoption by gas companies?
6. Are cast iron pipes better and cheaper than wrought pipes for gas mains of 2 to 4 inches in diameter?
7. Does it pay to coat gas mains with coal tar?
8. What is the average life of a meter in constant use, with ordinary good care?
9. Is not illuminating gas of good candle power, sold at a reduced price for fuel, the true solution of the fuel gas problem?
10. Which is the correct method of tapping mains, on top or at the side?
11. Is the Welsbach burner with natural gas a success, and what proportion of the lighting does it do in towns having both natural and artificial gas?

Other interesting questions have been proposed, which will be presented at the meeting, and members are requested to come prepared to participate in the discussion of the above papers and questions.

Provision has been made for an exhibit, in connection with the meeting, of all kinds of gas appliances and apparatus, a large room on the ground floor, a few doors from the hotel, having been secured for this purpose. No charge for floor space will be made to exhibitors, and those desiring to avail themselves of this excellent opportunity of displaying their specialties will consign their goods and address their communications to Mr. Chas. R. Faben, Jr., Supt. Gas Light and Coke Company, Toledo, O., who has the matter in hand, and who will arrange the exhibit to the best advantage of all concerned.

In addition to this exhibit there will be other objects of much interest to our members and visitors, and the meeting promises to be in every way successful. It is hoped that every member will show his appreciation of what has been done, by being present; and gas companies not heretofore represented at our annual gatherings will be profited by sending a representative to this meeting.

A cordial invitation is constantly extended to all who may desire to become members of the Association, to do so, and the Secretary would be pleased to hear from any such persons.

IRVIN BUTTERWORTH, Sec'y.

BRIEFLY TOLD.

THE MEETING AT DALLAS, TEX.—Before the current issue of the JOURNAL will have been in the hands of a large number of its readers the members of the Southwestern Association will be in session at Dallas, Texas, the convention days for the same having been fixed at the 12th and 13th insts. There is no blinking the fact that the gathering might have been more extensively advertised, with the certain result that the attendance would have been thereby benefited. Admitting the paucity of notification, however, it is gratifying to be able to say that it was not from neglect of the Secretary, nor from any inclination on his part to lukewarmness in respect to advancing the Association. Secretary Russell, just at the time when his best efforts would be put forth in preparing for the meeting, made a change in his business relations that caused him to leave Houston in order that he might re-attach himself to the Galveston Company. The disorganization consequent upon this action is the good cause for his seeming dilatoriness in respect to advertising the Dallas gathering. In the meantime, both President Enfield and Secretary Russell have not been idle in correcting the earlier omission, and so well have their efforts been responded to that, from our current advices, we confidently look forward to a good and valuable meeting. The gas makers of the great Southwest are very differently situated from their brethern of the East, West and South; and more especially does this remark apply to Texas, where the companies are, in common with other manufacturing interests, largely at the mercies of the railroads. The time will come, however, when engineering skill, backed by ample capital, will emancipate Texas from the iron (or steel) clutch of the railroad magnates, who, with rare blindness, seem bent on withering the resources that it should be their closest aim to foster. No matter whether it be a Willetts, of San Antonio, with his cherished plan of "a corral in the sea," or some one else, a Moses is sure to show the people of the Lone Star State the high road to competition in commerce. This oddity of position ought to cement the gas men of that section in more than ordinarily close counsel. We hope that the meeting will be a successful one, and shall look forward to a report of the proceedings with eager anticipation.

THE LATEST GUN FROM TOLEDO.—During the week we have received a circular from Secretary Butterworth—certainly no one can accuse that gentleman of a lack of attention to his duties as Secretary of the Ohio Association—which is in the nature of a "personal talk" between the members and himself. As a circular, then, we are unable to print it, because of the fatal words "not for publication." As it contains some matters that are worthy of especial mention here, why, we will make due note of these, and feel that in doing so the injunction "not for publication" will not have been infracted. In the first place, the Secretary notes that the Boody House, which has been selected as headquarters and place for meeting, is in all respects a first-class hotel, and that its ordinary rates are from $3 to $5 per day, according to the location of the rooms. The Committee of Arrangements, however—no doubt Charlie Faben could tell something about this—seem to have convinced the Boody House proprietor that gas men are such desirable fellows to have about a hotel, that he could see his way clear to making a concession. In any event, a uniform rate of $3 per day has been arranged for the members and their guests. There is possible trouble in the suspicion that the Boody House may not be large enough to comfortably receive all those who will seek its shelter. Should there be an "overflow" that contingent can undoubtedly count on good quarters at the Madison House, which is close to the Boody. The Secretary gives it as his belief "that the meeting will be very very interesting and profitable," and in that belief we heartily share. He also asserts that the exhibit of gas appliances and apparatus promises to be very large and interesting. The outing part of the meeting will include a visit to the factory and showrooms of the Central Chandelier Company. Indeed, there is every indication that the Ohio's Sixth Annual will not be in any respect inferior to the rousing gatherings of its first half decade.

THE SLATER AND PARKER PAPERS.—In our current installment of the proceedings of the New England meeting are many interesting papers and much lively discussion that are sure to be closely read and remembered. In selecting at this time the papers noted in the heading we do so from the fact that one or two points in each seem to call for especial emphasis. Mr. Slater is nothing if not frank, and in his frankness is never illogical. His reference to the "feeling of hostility and even bitterness engendered by the early introduction of water gas" paves the way for a later expression in his paper that is worth reproducing here. This is: "I will say, however, in passing, that in my judgment the feelings to which I referred, of opposition to water gas, etc., etc., were not engendered so much by the gas, or its composition, *per se*, as by the aggressiveness displayed by its early patentees and advocates in forcing its introduction by questionable methods, even before it had reached its present perfected state." And the "bitterness" that was thus engendered had reason for its existence. Questionable, indeed, were the methods employed; and those methods are as much in disfavor to-day amongst men of probity as they were in the early eighties. No; the objection was not so much against the process of manufacture as against the "processes" of the financiers who were interested in its development. Mr. Slater, however, puts the matter so concisely and truthfully that we might take leave of that portion of the subject at this point. We do not concede the soundness of his conclusions about the carbonic oxide content in water gas, which will surely be availed of before long by the incandescent electric lighting promoters, who have armed themselves with some striking figures as to its potency. In fact we think the least said about carbonic oxide the better it will be for the gas maker. In the Parker paper we consider his experiences in the manufacture of coal and water gas, have been, to say the least, one-sided, with the leaning all in favor of water gas. In fact, if the figures of this year's report of the Massachusetts Board of Gas and Electric Light Commissioners are to be accepted as fair, we fail to see wherein the new method is in any essential respect an improvement over the old, save in the instance of the greater ease with which a water gas plant can be operated. If facility of operation is the desideratum then the new plan has it. But we nevertheless incline to the view that greater advances are in store for the coal gas process than for its co-adjutor. The long and short of it, however, is that both will likely work in harmony and to their mutual benefit.

ELECTRIC LIGHT INSTALLATIONS, ETC.—We are in receipt, from the D. Van Nostrand Company, of this city, of a copy of Sir David Salomon's (Bart., A.I.C.E., etc.) "Practical Handbook of Electric Light Installations, and the Management of Accumulators." The book, which is now in its fifth edition, has met with great favor; and this seems to have been fairly earned. Sir David treats his subjects in a manner well calculated to gain the confidence of the reader, and we have no hesitation in recommending the book. It is well printed and profusely illustrated. The Van Nostrand Company are the agents in America for the work, the retail price of which is $1.50.

Facts and Figures Connected With the Installation and Operation of an Electric Light Plant.

By Mr. JOHN J. POWER, Supt. Natchez (Miss.) Gas Co.

Your issue of February 17th, contains a letter from Mr. J. Smart, President Port Hope (Ont.) Gas Company, appealing to gas managers who have had experience as to cost of installing and operating an electric light plant.

Having built and managed the Natchez Gas Company's electric light station here (though somewhat larger than the one named by Mr. Smart), my experience in that branch of our works may be of some benefit to him, or to some other members of the gas fraternity.

In this connection I would say, that through the columns of your JOURNAL I have been able to gather a varied store of new ideas and information, that many times assisted me in overcoming the difficulties that lie in the gas manager's path; and in this, my first communication, I return my thanks to the JOURNAL and its many able contributors;

and though my crude letter may be wanting in full details, if it is of any assistance it will have accomplished my object in writing it.

The Natchez Gas Light Company, nearly 2 years ago, decided to put in an electric light plant, principally for lighting the streets of our city, which were at that time lit by 110 gas and about 70 coal oil lamps; and after having the same experience as Mr. "S." with the agents of electric lighting companies, they finally chose the Thomson-Houston system, and contracted with that company for a complete outfit of 100 2,000-candle power arc light capacity, the gas company reserving the right to choose the kind of steam boiler and engine to be put in. All the work was done under my supervision. The plant consisted of 1 Hazelton boiler, 125-horse power, and a Beck engine, 100-horse power, with a Stillwell exhaust steam heater and purifier, 3 dynamos—2 of 35-light and one of 30-light capacity—all the lamps and attachments and cost of building to be in the contract, together with 21½ miles of wire. The plant, complete, cost the company $25,000.

The building, part frame and part brick, is all covered with corrugated iron, 40 by 60 feet; the boiler and pump room is 19 by 40 feet; the space occupied by boiler is 10 feet in diameter. A brick wall divides the boiler from the engine and dynamo room, which occupies the remainder of the building, 40 by 40 feet. Great care was exercised in having good ventilation, which is absolutely necessary for the safety of the dynamos. In putting in foundations for engine and dynamos, I was very careful to have good work performed. The engine foundation is 6 feet deep, on good solid earth, 1 foot of cement and 5 feet of brickwork, laid in cement mortar, every brick shoved and joints struck. The mortar was composed of 1 part cement to 2 of sand. The sides of foundation have a pitch of 3 inches to the foot. The foundations for dynamos were similarly constructed; but only 3 feet deep. To-day those foundations are solid as can be. I have balanced a silver coin on edge on cylinder head of engine when running at a speed of 265 revolutions. We have the Scheiren perforator dynamo belts; and, after a year's hard wear, there is not a flaw or crack to be seen in them.

Our repairs on plant have been very slight, and embrace a new wrist pin in engine, nothing on dynamos; and, except for making some changes on extension shaft of engine, which were necessitated by having to put in another engine to run on incandescent dynamo, might be said to be nil.

Our boiler has proved a great success, making a great saving in fuel; for, from several tests which I have made, both with water evaporation and from card from engine, with Pittsburgh nut and slack (very little nut) we have obtained a horse power for 3.8 lbs. coal consumed. It is easily handled, a very rapid steamer, and, from my knowledge of others of the same make, very durable.

We are now running up to full capacity—84 arcs and 51 incandescents (series) 65-candle power. The city has given us a 5 years' contract, which we obtained after a bitter fight with a rival company, at $85 per year for 2,000-candle power lights, all night and every night. We have 79 on the streets; also, 17 65-candle power incandescents, at 1½ cents per hour each. The balance of our lights are taken in stores.

Our operating expenses for an average month are as follows:

Engineer	$80 00
Fireman	50 00
Trimmer (who furnishes his own horse and wagon)	75 00
Lineman (5 days repair line, new lamp ropes, etc.)	10 00
Coal, Pittsburgh slack, at $3 per ton	175 00
Carbons	70 00
Repairs, new brushes, commutator segments, new globes, etc	18 50
Oil, $16, waste, $3.50	19 50
Total	$498 00

To this must be added wear on plant, interest on investment, and insurance. So far everything works smoothly, and every visitor to the city claims that we have the best and steadiest lights that they have met with anywhere. The only credit in this connection which I can claim, is that I take especial care to keep everything around the machinery, especially the dynamos, clean and in good trim.

In conclusion, I would say to the intending purchaser of an electric plant, get the best of everything. First, a good system; second, a good steam plant, that will save cost of fuel, which is the heaviest expense in operating; third, suitable buildings, strong, well ventilated and dry; fourth, good men to operate your machinery—it is poor policy to try to get a cheap man, because he is cheap, to run valuable machinery; and last but not least, get the best wire and have it well and securely put up. If of poor quality and poorly put up, it will always be a source of expense, dangerous, and a continued worry to all connected with the plant.

Sulphate of Ammonia as a Manure.

We learn, from the *Journal fuer Gasbeleuchtung*, that the German Gas Association has had presented to it a report of its Committee on the above subject, which was read by Professor Bunte, of Carlsruhe. The funds for the investigation were subscribed by various German gas works, and the work was carried out by the German Agricultural Association, through Professor Marker, of Halle, and Professor Wagner, of Darmstadt. Professor Marker's work was fieldwork, in 40 places all over Germany. In each place a field, as uniform as possible, was divided into two sections, and each of these again into five divisions, each of which had an area of about 3,000 square yards. These plots were used for the study of two questions: one bearing upon the comparative inefficiency of ammonia-sulphate manures in soils containing little or no lime; that is, what is the action of carbonate of lime on the manuring activity of sulphate of ammonia? The result is that lime or marl greatly increases the efficiency of sulphate as a manure.

The year 1888 was very unfavorable for experiments; a late spring, an extraordinarily dry summer, and a heavy rainfall in autumn, which swelled up the crops and predisposed them, especially potatoes, to disease. Still, over all, the comparative statements are worth relating.

Fine powdered lime, 1.6 cwt. per acre, was lightly ploughed in. The variations were: (1) No sulphate, no lime; (2) no sulphate, but lime as above; (3) weak sulphate, no lime; (4) weak sulphate, with lime; (5) strong sulphate, with lime. The "weak" sulphate means, for barley, 80 lbs. sulphate, for beet, oats, potatoes, etc., 120 lbs. per acre; "strong" means 120 lbs. for barley and 200 lbs. for the rest. A phosphate manuring, and in light soil, one with 3.2 cwt. of kainite per acre, ran side by side with the sulphate manuring.

The increases with sulphate were, in pounds per acre:

Oats	546.2	lbs. grain,	and	946.7	lbs. straw and chaff.	
Barley	203.7	"	"	58.0	"	"
Winter wheat	158	"	"	234.0	"	"
Beet-root	197.3	" roots.				
Turnips	491.2	"	"			
Potatoes	646.8	" tubers.				

With strong sulphate manuring the increase was still greater.

As to combination of manures, the increases were:

	Lime alone.	Ammonia alone.	Lime and Ammonia.
Barley (grain)	95.7	203.7	535.4
Oats "	147.7	546.2	947.4
Wheat "	59.6	158.0	211.4
Potatoes (tubers)	868.4	646.8	1369.2
Beet (roots)	— 229.6	+ 1964.2	+ 2401.2
Turnips (roots)	+ 640.8	+ 4823.8	+ 4129.6

The second question was the comparison of ammonia sulphate with Chili saltpeter. The variations were the following:

	Barley.	Oats, Beets, and Potatoes.
1. No nitrogen manure	—	—
2. Weaker Chili, pounds per acre	110	176
3. " sulphate, " "	88	141
4. Mixed (2 and 3) half each	—	—
5. Stronger Chili, pounds per acre	176	440
6. " sulphate, " "	141	212

The following are the results:

I. Weaker Chili manuring produces much smaller increases than stronger. Barley grain, 207 and 366; barley straw and chaff, 188 and 459; oat grain, 559 and 763; oat straw and chaff, 956 and 1,403; potatoes, 2,401 and 4,912; beet root, 7,200 and 11,645 pounds per acre of increase respectively.

II. Weaker ammonia manuring has, with all the crops, as much effect as an equal quantity of nitrogen applied in the form of Chili.

III. No. 4 produced, with all the crops, the same effect as either No. 2 or No. 3.

IV. With cereals the results under heavy manuring (5 and 6) was the same whether with Chili or with sulphate. With roots the nitrate had the advantage; it brought out 1,312 pounds potatoes and 1,780 pounds beet to the acre in excess of what the strong ammonia did.

Professor Wagner's researches were conducted with plants in plots, which were moved on a barrow between the open air and a greenhouse. His results confirm those of Professor Marker, especially as regards the beneficial effect of lime in conjunction with sulphate. He concludes that, practically, equal weights of Chili saltpetre and of sulphate of ammonia produce the same effects, and that the advantage which Chili sometimes appears to have over an equal weight of sulphate is due to the absence of lime in the soil, and to the action of the soda on the plants.

OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 286.]

TWENTIETH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD AT YOUNG'S HOTEL, BOSTON, MASS., FEB. 19 and 20, 1890.

FIRST DAY—FEB. 19—MORNING SESSION.

Mr. Waldo A. Learned (Newton, Mass.) then read the following paper on—

REVIVIFICATION OF OXIDE OF IRON.

Numerous attempts have been made to revivify oxide of iron *in situ*. Air is introduced in the gas, which not only reduces the candle power, but causes heat and back pressure in the boxes. The loss of candle power may be very small in a gas heavily charged with hydrocarbons—the gas being made by a low heat; but in many works when the heats are high there would be an appreciable loss of candle power.

My experience with air was in July, 1887, when our purifiers ran six weeks without change, purifying 19,600 feet per bushel of oxide. The candle power was reduced and the deficiency made up with an enricher. The heat in the boxes induced me to increase the pressure on the retorts, when a change of purifiers was the result.

Oxygen is used in place of air with good results, provided your purifiers are large, the oxide of good quality and the coal carbonized very free from sulphur, or means taken to remove a large portion of the sulphureted hydrogen before it gets to the purifiers.

Another method has been to force air up through the material, the cover being removed or a special outlet provided. The heat of the steam, with the heat due to the chemical change, produces a high temperature, which causes fire and bursting of the boxes by expansion.

I wish to speak more particularly of the method we have adopted, and used for 28 months, of revivification in the boxes by drawing (not forcing) air through the material by the aid of a steam-jet exhauster. The exhauster is made of a 3-inch to 2 inch cast iron reducer, with ¼-inch steam injection pipe, tapered at the end. Connection is made with the inlet of the purifiers by 3-inch pipe. The outlet pipe of exhauster extends through the roof of building.

The purifiers (12 × 16) are in series, with a dry center seal. The material used is Irish bog ore, a natural oxide of iron, purifying 3,500 feet per bushel; also, a prepared oxide, commonly known as sponge, purifying 4,500 feet per bushel. This sponge, which is made at our works, consists of 15 lbs. iron filings, 10 lbs. sal ammoniac and 1 lb. copperas to a bushel of coarse sawdust. The shavings are wetted with a solution of silicate of soda and water to make them less combustible.

It is a well known fact that when the oxide takes up sulphureted hydrogen from the gas, there is a liberation of a quantity of water which the shavings probably absorb. When revivification takes place about one half the quantity of water is taken up. The moisture must come from the air or the shavings, and a number of reactions may wash off the solution. However, for practical working with new material, there is a decided advantage by its use. It is not essential to use copperas, which is sulphate of iron, and it acts simulaneously on ammonia and sulphureted hydrogen. My method of working is such that it leads me to use it in the mixture.

Coke breeze is used on the bottom layer of purifiers, then 18 inches of oxide of iron and 3 inches of lime on top layer. The object of the lime is to take out carbonic acid. I cannot agree with some of my friends that it is cheaper to enrich the gas than it is to use lime to make up the loss of candle power due to the presence of carbonic acid in the gas. When the material in the box is foul, the cover is taken off, the lime removed, the steam jet exhauster started on two tenths vacuum, which varies with the density of your material, and in from four to six hours it is thoroughly revivified.

The oxide is then turned over in the box to maintain its porosity, as after each revivification the material becomes more dense and the trouble would be back pressure. With the sponge this operation would not be necessary on account of the lightness of the material.

Heat is the greatest impediment in the way of successful revivification. Our first attempts were made with fear and caution. Steam was then used to aid revivification by its moisture, and to reduce the temperature in the material. The steam heat and the heat due to revivification caused too high temperature for successful working. This led to the introduction of water forced over the bottom of the purifying boxes—the object being to reduce the temperature, which was successfully accomplished,

The highest temperature recorded in the foul material in the state of revivification was 225° Fahr. It should not be above boiling point, as sulphur melts at 235°, when the porosity of the mass would be affected. We have no definite knowledge of the chemical changes that take place in the purifiers, which vary with the quality of coal and conditions of the gas; but we do know that with iron purification, the sulphur compounds are more erratic in their behavior than with lime purification. A box will show sulphureted hydrogen one day, clean the next, followed by foul indication on the third day. It has been stated that this sudden change is due to bisulphide of carbon—it has no chemical combination with oxide of iron as it has with lime, but seems to be mechanically bound on free sulphur. A sudden change of temperature and pressure will throw this impurity off in the gas.

With lime purification we have noticed this rise of sulphur, when our custom of changing purifiers was to allow the third box to do some of the work after the second showed sulphureted hydrogen, the object being to allow the second box to act on bisulphide of carbon the contents being foul. It was only until then in proper condition to act upon this impurity—the first box removing carbonic acid, the second bisulphide of carbon, and the third sulphureted hydrogen; but when the second box receives an access of sulphureted hydrogen, or when carbonic acid comes over from the first box, the conditions change and contents of the second box become useless.

Discussion.

The President—You have heard a very interesting paper. I think Mr. Neal, of Charlestown, has adopted a similar plan; we would be glad to hear from him.

Mr. Neal—I attempted it, then for a time ceased the attempt, only to attempt it again. The first attempt was made with Mr. Shiras, who came to see me about it. He recommended revivifying by injecting steam. I did it splendidly, setting fire to the trays, burning them all up, and making a most intolerable smell, which was a nuisance all round. I think we ran very great risk. That plan was abandoned, and I did not again venture to revivify with lime in the purifiers for a long time. I have used oxide of iron, or iron sponge which I procured from the Connelly's with moderate success. Of late years and for some time past my Superintendent has manufactured the oxide of iron, using pretty much the same materials and the same mixtures used by Mr. Learned. Sometimes I have purified 18,000 feet to the bushel, and sometimes 2,000. It varies very markedly. The sulphur content varies sometimes, from 6 or 8 to 16 or 17 grains. We are using Westmoreland coal. We have for some time past used a steam-jet exhauster similar to that described by Mr. Learned. We remove the cover and let on the steam, and that draws the air through the mixture. For a while, even with the use of air in that way, the boxes became very much heated. I abandoned the use of steam, or at least of air, and then I commenced again. The trouble is when the oxide of iron is first made it is very "sharp," and heats very readily. Then, after awhile, finding that the heat was so great, we would revivify for awhile by drawing through the air to take out nearly all the sulphur, revivifying it very nearly. Our practice is now, after about 4 hours, to take the mixture entirely out of the boxes and place it on the floor of the adjoining shed prepared for that purpose, where it is turned and wetted thoroughly, and then put it back. I asked my Superintendent if that was not unnecessary work. He said it cakes on the bottom of the trays so that it makes a back pressure; therefore it is removed and then placed right back. We find that if we leave it in the boxes to revivify it will heat very badly. I must say that our purifiers, for our manufacture, are rather small, and require to be changed quite often—perhaps the purifiers do not do the work that they ought to do, because we manufacture water gas. I would say, by-the-way, that the coal gas and the water gas are mixed just before the gases reach the purifiers, where they come in with a tremendous rush, and I have found it necessary to prevent the blowing out of the seals of the purifiers, which were rather low, to use a jet exhauster to draw the gas through after passing the meter. This jet exhauster stands between the meter and the gas holder, and it works admirably. We can set it so that the pressure on the purifiers will be almost nothing, or at 2 or 3 inches. By that means I can make water gas, with light seals and small purifiers, to a very great advantage. In speaking of our process of purification, I will say I use a layer of sawdust on the bottom tray, and then place over it cloth or bagging to keep the oxide from mixing with the sawdust. Of course, the sawdust will last for quite a long time. I do not use the shavings which Mr. Learned speaks of.

Mr. Learned—I use breeze instead of shavings.

Mr. Neal—I use as coarse sawdust as I can get, from pine wood, not from hard wood. I am very well satisfied with my present method, but would like it better were it not that we have to change the mixture on the trays.

Mr. Jones—I would like to ask Mr. Neal how any saving is effected,

seeing he continues to remove the oxide from the boxes, and spends money in the removing and handling of the material.

Mr. Neal—I can save something, because the boxes are so small that our purifiers are changed very often. If we remove the mixture we have to turn it over and over, and it does not revivify near so fast—not fast enough for practical use.

Mr. Stedman—You spoke of the oxide heating after it has been returned to the box. Do you mean before the cover has been put on?

Mr. Neal—It would heat after we put it back. It heats after revivifying, if we leave it in the boxes.

Mr. Stedman—I became interested some months ago in brother Neal's success, and got his formula and commenced trying some experiments myself. My object was to get as much iron in the purifier as possible with a given bulk of sawdust. We found that we could use 3,000 pounds of iron with 100 bushels of sawdust, but beyond that point it had a tendency to cake up too much, even when it was first oxidized. We tried various systems of revivification, with the usual result of getting afire now and then; but we watched it pretty closely, and it did not burn out anything more than a small hole each time through the trays. It occurred to me that if we could send air enough through the oxide in a given time we could control the matter of temperature to a great degree. At one of the abandoned gas works we had a large blower and a little engine, which we transferred to our other works and are now using it experimentally. We found that we could always control the matter of temperature, when there was a disposition for the oxide to get too hot, by sending an extra current of air through. The ignition does not follow as it would when you start a fire in the woodpile, and where, when you give it more air, you encourage the flame; for, of course, the result of the heat from oxidation is quite gradual, and, if it can be carried off at any time by means of a good, fierce blast of air, the temperature can always be kept low. We find it rather desirable to encourage high temperatures to facilitate oxidation. In sending through a large blast of air, we found that the oxide was unduly dried, and required moistening again to make it immediately effective when the gas was turned on. We, therefore, adopted the plan of turning the exhaust right into the inlet pipe of the purifier. We have a wet center seal, and by cutting a hole in the top, over the dead part of the seal, and connecting the exhauster there, we have the connection made at the right place every time. When the purifier cover is lifted, we put the blower on for a few moments with a very rapid blast of air, and blow the gas out which is in the purifier, and then run a slower blast, watching it pretty closely at first, until we have ascertained that the temperature is not going up, and still that we have not got an excess of air in there to keep the temperature down too low. With that method of working we have been quite successful. The oxide does not cake; we do not have to turn it over; and we should not have to take it out of the boxes at all were it not for the fact that our scrubbing facilities are too small for the additional work which has been thrown upon them by the consolidation of all the work there in one place; and consequently considerable tar gets into the purifier. We arrest that by a pretty thick layer of breeze on the lower tier, and we find that the breeze gets saturated in about every third or fourth time coming around to that box. We then take out the oxide, renew the breeze, put the oxide back again, and it is already to work again.

Mr. Neal—I might say with regard to the ammonia, that perhaps our method of revivifying, or rather of purification by the use of the oxide, answers the purpose of a washer or scrubber. Our washer is not as effective as it ought to be, and the gas comes in containing say 100 grains of ammonia to 1,000 feet; but when it comes out, by the State Inspector's test, it never is over one per cent. Of course it is working the purifiers very hard, and I would like to put more work on the scrubbers.

Mr. W. A. Wood—I did not quite understand Mr. Stedman's operation. Does he force the air up through the sponge into the inlet pipe?

Mr. Stedman—Yes.

Mr. W. A. Wood—You might draw back on the inlet pipe and pull it through. By exhausting from above downward, the heat of course starting at the bottom, the lower trays can be taken away more easily.

Mr. Stedman—I supposed that the heat was where the air would come in contact with it first.

Mr. W. A. Wood—It seems to work the other way. If you heat at the bottom, and take that heated layer away before it has time to fire the sponge, there is no danger of fire. I have run in that way for three months without taking the material out of the boxes. We did have some fires when we first attempted it, but we manage it now so that two men practically do all the work in our purifiers; and we were obliged to change the boxes nearly every day. It is a very great labor saving to us.

Mr. Allyn—About how long does Mr. Wood carry on this operation?

Mr. W. A. Wood—From four to six hours. I will say that I do not think the revivification is as thorough as when the sponge is taken out and turned over.

Mr. Allyn—Do you detect more back pressure?

Mr. W. A. Wood—The sponge does cake with us after we have revivified four or five times. Our method then, is to take out the oxide at the bottom of the box and throw it up on top, and put the loose material which has not caked down on the trays again. By turning it right in the box itself we get rid of the trouble from that pressure in a short time. I like that method by reason of the fact, if you are obliged to change the purifiers, on account of back pressure, you can get a fresh one in a very short time.

Mr. Allyn—I think Colonel Stedman is right in his supposition, that if the gentleman would allow more air to enter the purifier there would be less danger of generating heat. When I was at the Brookline works, complaint was made on account of the odor which escaped when the lime purifiers were being emptied, so to overcome the nuisance, I put on an apparatus similar to what Mr. Learned is using, and on the first experiment we merely removed the substance through the corner of the purifiers. In 15 minutes it generated so much heat that it was impossible to put a hand on the purifier. After that, we raised the cover enough to just unseal the edge of it, and then had no more difficulty—the purifier never heated at all.

Mr. C. S. Spaulding—We use that same apparatus to-day for revivifying our sponge. We use it as has been mentioned, drawing the air down through and taking the cover of the pan entirely off. We are troubled with heat, and have had fires, but not to amount to much. We leave it in the pans three or four times before taking it out. Every third or fourth time we take it out and put other sponge in, and let that stand out in the yard for revivifying. We find it a great success and a great labor saver.

Mr. Jones—I would like to ask Mr. Learned how much it costs for steam to revivify one box with the arrangement that he has at present?

Mr. Learned—I cannot tell. We have about 60 pounds of steam—a half-inch valve—and we open it about a turn and a half.

Mr. Prichard—I find that about 40 cents of steam replaces about $2 worth of labor.

On motion of Mr. Jones, a vote of thanks was tendered to Mr. Learned.

Mr. N. W. Gifford, of New Bedford, Mass., here read his paper, entitled:

SOME EXPERIMENTS IN THE PHOTOMETER ROOM.

In the introduction to a work on chemistry published in the year 1758, the author remarked something like this: "There are four elements, viz.: Earth, air, fire, and water. There may be other elements, but as we cannot possibly perceive them by our senses, it is idle to vex our minds with vain conjectures concerning them, and experiments usually lead to disappointment." Had this man lived in our day and been acquainted with the science of photometry, he might have still held the same opinion of experimental research.

I suppose most gas men have known of cases where the photometer falls into bad repute by giving the candle power much lower than the Superintendent believes it to be. I have noticed that this does not often happen when the gas is unquestionably of good quality, but when one fears his gas may be perhaps a candle below the usual standard. Then sometimes the boy reports the candle power down to 15 or even 14. His report is not received with favor, and he is sent back to take the candle power again. He looks at the water line in the meter, finds the candle balance accurate, flames at proper distances from center, etc., but still the pointer refuses to move up the scale. So, what wonder if he consigns the whole science of photometry to the realms of darkness? But says one, "There must be some cause for this remarkable drop," and some of the experiments, which I am about to call your attention to, may suggest some of the causes that may help to bring about this low candle power.

The photometer on which this work was done is of the open type, 100-inch bar, in a room from which the daylight can be shut out. Walls, floor, and ceiling painted a dead black. Size 7 feet by 15 feet, and contains about 900 cubic feet of air space. It is so arranged that gas or candles can be used on either or both ends. The standard of comparison used was a Methven slit. The burner was so arranged that the air supply to the light measured could be taken from a small holder at any rate desired, or could be left open as in the ordinary way. The following averages of several observations will show some of the effects of variations in the air supply, viz.:

Air supply open.....							gave	17.13 candles.
"	"	51	cubic	feet	per	hour,	"	15.22 "
"	"	46	"	"	"	"	"	15.97 "
"	"	42	"	"	"	"	"	17.10 "
"	"	35.3	"	"	"	"	"	17.82 "

Thus we see the normal amount of air used in burning 5 feet of gas was 42 cubic feet. When more air was forced through the burner, the light was reduced, and when the air supply was checked the candle power increased, until with less than 35 cubic feet per hour the flame began to smoke. An analysis of the gas showed that 28.19 cubic feet of air was required for the combustion of 5 feet of the gas. So that in the normal condition of things 13.81 cubic feet of surplus air passed through the burner, and, when checked to give the greatest amount of light, there was a surplus of 7.11 cubic feet of air.

So it appears that more air than a certain surplus passing through the burner tends to reduce the light. This reduction is probably largely due to the cooling effect of the aqueous vapor in the air, for when the air supply was passed through a desiccator, the loss suffered was not so great. For instance, the burner supplied with 38.1 cubic feet of dried air per hour gave a light of 18.34 candles, while with the same amount of undried air the candle power dropped to 17.38 candles, a loss of over 5 per cent.

As the volume of air passing through the burner depends on the size of the opening, height of chimney, and amount of heat inside the chimney, it can readily be seen that as the flame decreases, either on account of smaller quantity or a poorer quality of gas, the volume of air coming to it will not decrease in the same ratio. A 16.75 candle gas used 44.2 cubic feet of air per hour, and a 15.62 candle gas used 42.2 cubic feet, but the surplus above what was required for theoretical combustion, as shown by analysis, was almost the same in both cases, a difference of less than one-tenth of a cubic foot. So the weaker flame had as much unnecessary cooling to contend against as the stronger.

Now this disadvantage under which the poorer gas is burned can be overcome to a certain extent by altering the chimney, or by increasing the quantity of the gas to make up for the deficiency in quality. As an example of the first method, I give the following tests with chimneys of lengths ranging from 6 inches to 7¼ inches, but of uniform diameter:

With a	6	inch	chimney	the	light	was	17.64	candles.
"	6¼	"	"	"	"	"	17.34	"
"	6½	"	"	"	"	"	17.17	"
"	6¾	"	"	"	"	"	16,82	"
"	7	"	"	"	"	"	16.40	"
"	7¼	"	"	"	"	"	16.37	"

Here we find a decrease of light from the flame as the length of the chimney is increased, amounting in all to a variation of 7.7 per cent. from the result with the ordinary 7-inch chimney.

To show the effect of increasing the gas consumption, I give the averages of a number of tests in which the rate of burning varied from 10 per cent. below to 10 per cent. above the normal rate.

Gas burning		4-5	feet	indicated	c. p.	12.19.	Corrected	13.4.
"	"	4.75	"	"	"	14.72.	"	15.85.
"	"	5	"	"	"	15.82.		
"	"	5,25	"	"	"	16,88.	"	16.03.
"	"	5.5	"	"	"	18.29.	"	16.46.

In the last instance, increasing the gas consumption to bring the readings up to 18.29 candles gave a value of 16.46 candles to the gas after being corrected for the increased volume, which amounts to a gain of 64 candles, or 4 per cent. over the candle power found when only 5 feet per hour was burned. In consideration of these facts, would it not be simple justice to the gas, on these occasions of reported low candle power, to increase the rate of burning until the readings are brought up to about the usual figure, and then calculate the result back to a basis of 5 cubic feet per hour?

In connection with this subject of air supply, I have some figures which emphasize the necessity of thorough ventilation for the photometer room. I placed a Sugg burner at each end of the bar and took a series of readings, which showed the light from each to be alike. The room was closed for 2½ hours, when on supplying one of the burners with air from the prover, it was found to give 10.9 per cent. more light than the one taking its air from the room. Again, a burner supplied with 34 feet of air per hour gave a light of 17.77 candles, and on being supplied with the same amount of air having 5 per cent. of oxygen added to it, gave a light of 21.52 candles, or an increase of over 20 per cent.

Discussion.

The President—Have you any questions to ask with regard to those experiments? It is a simple type of experiment which may help some of us out of some of the difficulties which we have all experienced in the photometer room. Has anyone had similar experiences to state, or any questions to ask?

Mr. Humphreys—I would like to ask Mr. Gifford how, in his first set of experiments, he supplied the air to the burner?

Mr. Gifford—I will say that to an ordinary Sugg burner I made a connection through a paper tube large enough to slip up above, so as to go outside of the burner; and while it was not a neat mechanical job, I made it air tight by adhesive double tape. The bottom of the paper tube I connected with iron piping to the meter-prover.

Mr. Harbison—I think Mr. Goodwin, of Philadelphia, can give as much information on that subject as all the rest of the fraternity.

The President—We would be glad to hear from Mr. Goodwin at any time.

Mr. Goodwin—I can simply say that several years ago, from very similar tests, I can verify the statement made by Mr. Gifford. I practically did the same thing in my photometer room, and with practically the same results.

The President—Do I understand it is your opinion that we are to gauge our chimneys in order to limit the air supplied to the burner? Would it be advantageous to have the gas interest determine the size of chimney which should be used with a certain burner?

Mr. Goodwin—The size of chimney which you use makes all the difference in the world as to the illuminating power which you get from a given quantity of gas through a given burner. If the chimney is six, seven, or eight inches long, the difference in height will make all the difference in the world.

The President—Then each burner requires a certain chimney?

Mr. Goodwin—I mean to say that by varying the chimney on a five-foot burner, you get very different results as to the illuminating power, just as Mr. Gifford has stated. I suppose I have made 20 photometers in the past year, and have had ample opportunity for arriving at correct results. Several years ago I made some tests in the same direction, and I can verify Mr. Gifford's statement.

Mr. Coggshall—Then you would say that, using 17-candle gas, you would require a 6 inch chimney rather than a 7, according to his results?

Mr. Goodwin—I would not like to say that that would be the size of chimney, but I do say that the chimney has all to do with it as to the illuminating power.

The President—I think these experiments are in the right direction, and will go further as we find the necessity existing because of competition with the electric light.

On motion of Mr. Jones, a vote of thanks was tendered to Mr. Gifford.

A recess was then taken until 2:30 P. M.

FIRST DAY—AFTERNOON SESSION.

The afternoon session was opened with the paper, by E. G. Pratt, of Des Moines, Iowa, entitled:

DIFFERENCE IN THE EASTERN AND WESTERN METHODS OF MANAGEMENT OF GAS WORKS.

[In the absence of the author, the paper was read by the Secretary.]

I appreciate the honor of having been called upon to contribute something to the success of this meeting, and while I have regretted many times that I so readily gave my consent to write upon the subject suggested, and had, owing to the pressure of business, almost made up my mind that I would ask to be excused—in fact, was in the act of writing for that purpose—when, in looking through the AMERICAN GAS LIGHT JOURNAL, I noticed that the editor, in commenting upon what might be expected at the coming meeting of this Association, for some reason or other, I know not why, laid considerable stress upon what might be expected from the papers to be furnished by the gentleman from Dedham, and myself. He, however, very adroitly warned the members that the quality of the reading might be only in the title, or cover, which I am very sure will be the case with what I shall have to say; hence I hope that neither he nor any of the members has anticipated too much, for with the very short time now at my disposal I shall not attempt to approach the dignity of a paper, but rather let this pass as a letter to the Association. I did think, when the subject was first mentioned, that it would be an easy matter to write up something interesting—and there was certainly an opportunity of saying a good deal; but, upon a serious second thought, and when I got right down to business, I found there was not so much in it after all—at least unless the one who attempts to speak has confidence that he is perectly familiar with the affairs and conditions of things as they exist in the East compared with that of the West. It would be generalizing too much for me to make a statement that what has been my experience or observation in the East, while in charge there of the affairs of a small gas works, would apply to that of another in charge of a larger works; or to submit what has since been my experience and observation while living in the West, in charge of the

affairs of a larger concern, was applicable to those of the same size or larger, and I am fearful, too, that I might say something that would invite criticism, or that some member would take exception too. I trust, however, that in giving expression to my observations there will be nothing said to reflect upon either locality; for, certainly, that is not my intention.

It is a pleasant thing, and I am sure New England gas men appreciate it, to be so situated where, because communication is easy, that they do not have to depend entirely upon these annual gatherings for an exchange of greeting and ideas (for probably not a week passes but that you can count upon meeting some gas man eager for information, or willing to impart it, upon some particular point), while we in the West (and I speak as if I had always lived here), are more or less dependent upon the technical papers for what is going on; or, in an emergency, have to rely entirely upon ourselves, or those at our command. This same sentiment I think will bear me out in what I have to say. Take it in the matter of supplies. You of New England can, on twelve hours' notice, get anything you are in need of, not excepting even coal and pipe; and the cost of getting it is immaterial as compared with what, under similar circumstances, it would be here in the West. It is necessary, therefore, for us of the West, to so anticipate all our needs that we can buy in such quantities and at such times that the expense of getting them will be the least, and that they will be on hand at the time when needed most. While it is true that the handling of freight has been greatly improved, still, at its best, it is very slow and often times very unsatisfactory, particularly for such goods as we may be looking for from a distance. If we resort to express, as frequently we are obliged to, the expense thereof adds very largely to the cost of the article. I mention this important factor of transportation to show that the gas man of the West is obliged to take more thought of the morrow than his brother of the East; and hence is cultivating that essential known as "long-headedness," which, by-the-way, is very important in this part of the country, and concerning which I may have more to say later on.

In the matter of labor, I believe it to be true that we pay more here than in the East—not that the cost of living is more, or that the demand for labor is greater, for I do not think there is much difference; but there seems to be an independence innate with the locality that demands more. And, too, the Western laborer is more liberal in his expenditures than his fellow laborer of the East. He takes more recreation, and has more enjoyment of this world's goods. It is also a fact that the average Westerner is wasteful, which habit, I am sorry to say, is sometimes prevalent about a gas works, and it very often disturbs the peace of mind of one brought up in thrifty New England. Then, again, not so much attention has been given to the general condition and appearance of things about the works; for what reason I know not, except it be that false idea of economy that it were better to run a thing for all it was worth and make the repairs only when those became actually necessary, or when the profits would admit. For such a condition of things I believe the management to be directly responsible, and that by proper discipline it could be obviated. The New England gas manager, as a general thing, takes pride in keeping his works in such condition that they will pass inspection at any or all times; and I believe he does this at no greater expense in the end.

I have referred briefly to some of the inconveniences under which the Western manager labors, whereby his operating expenses are in excess of yours in the East; and were it not for the fact that these were to a great degree offset, we would not be able to sell gas as cheaply here as at present is the case. In looking through the directory and noting the price of gas at seven of the largest cities in the New England and Middle States I find that the average gross cost is $1.44 per 1,000 cubic feet, while in seven of the largest of the Western cities the average gross charge is $1.46 per 1,000. Just how to explain this I do not know. If all the companies considered were making coal gas, I should say it was because of the value of residuals in the West, as the price we get for them is in excess of what they bring you in the East. We have a market for all our coke and tar, and while the price of the former depends upon the price of hard coal, the demand for the latter is such that we have no difficulty in disposing of our entire output at good prices.

As is well known, however, many of the larger works in both sections of the country have equipped themselves, or are about doing so, with a water gas plant, either because they believe they can make water gas more cheaply, or because no gas works is now considered complete without them, all of which no doubt lessens the supply of these residuals, and so increases the value of what is left, because the demand, at least, remains the same.

There is an advantage, too, that many of us favorably located in the West have, in being able to use the cheap coals mined throughout this section of the country, which, if not suitable for gas yielding, are certainly very helpful and economical for fuel purposes; and, on account of their cheapness, many of us are enabled to sell our entire output of coke by using these cheap coals under our boilers and in our furnaces that have been specially adapted for the purpose. At some of the Western works they are able to use a large percentage of these native coals for gas making; and mixed with Youghiogheny, Penn, or Westmoreland, get very satisfactory results, both as to yields and candle power.

In the matter of main laying, we have an advantage, inasmuch as the expense of laying pipe here is, on account of the condition of the soil, not so great, even though in some instances we lay our pipes deeper. It may be said, however, that we lay more of it, and that the immediate consumption is not so great to the mile as in the East. This may be explained from the fact that Western towns and cities grow more rapidly, and that to keep up with the prospective growth we are obliged to keep in advance of city improvements, such as sewering, paving, etc., that all come at once. We frequently lay pipe in a street or locality that to an Eastern man would seem like madness; or as it did to me until I had become somewhat accustomed to the growth of these Western cities. Then, again, much of our pipe was laid originally with little attention as to width of streets, grades, etc., and later on, when these city improvements materialize, we are annoyed with the expense and difficulties incident to straightening, lowering or raising our mains. Many of us, too, are troubled with excessive leakage, which cannot be improved upon until we have instituted a thorough and systematic means of stopping it. The prime cause of all this is probably owing to the fact of the pipe having been originally laid by some contractor who did not consider it important that the joints be made tight, so long as the required weight of lead and yarn was used. These thoughts suggest a whole chapter of difficulties; but of which I will not speak, least I say too much that would be of little importance or interest to you.

In regard to the consumer, I may say he is just as fond of finding fault here as elsewhere, and cannot understand why his bill should be larger in December than it was in July, or that the price should be any in excess of what it is in cities or towns selling more, or that are more favorably located. Naturally he takes gas to be gas, whether here or in the coal fields of Pennsylvania; that is, he assumes it to be his honest belief. He is alive to all new processes, and whenever he reads that some man or woman has invented a processes by which gas can be made for 5 cents per 1,000 cubic feet, he is anxious to know why the local company does not adopt such process and give the public the benefit of it. If a deaf ear is turned to his suggestions, then he is in for organizing a company that will adopt the "new ideas," and very frequently finds plenty who interest themselves with him, until after investigation he or they find that it is a myth. Nothing daunted, however, he is always ready for any new process that may present itself, never for a moment stopping to think that we in the business are alert to any new thing; and, if it can be shown to be an improvement over or in addition to what we have, are ready to adopt it and to give our consumers the benefit of it.

It seems to me there are more schemers, or those who live by their wits, in this western country than east; and as franchises are easily acquired, one must keep on the alert all the time, and even sleep "with one eye open," to protect those interests that have been placed in his keeping. The people, however, in communities where this thing has been practiced, noting the repeated failures of these schemes and schemers, are beginning to understand the real status of the case and decide that the local company is not made up of such short-sighted and close-fisted set of fellows as they were at first made to believe.

It is discouraging sometimes to think that the propositions of these people even find audience, when it is considered how attentively we look after the interests of our consumer; but it is to be presumed that human nature is alike in this thing as in many others, and the willingness on our part is usually taken advantage of.

People of the West are fully alive to any new method of lighting, and will be satisfied with nothing but the best. The electric light is cutting quite as important a figure here as elsewhere, and in the smaller towns has materially affected and seriously injured the business of the local gas companies, unless they were far-sighted enough to equip themselves with an electric plant to meet the exigencies, and thus keep out the opposition that is sure to establish itself. While in most of the larger cities the sales of gas continue to increase, still many of these have or are contemplating the necessary plant to supply either kind of light, for they do not believe they can afford to turn away a customer that would patronize them because they did not have the kind of light he had made up his mind would best suit his purposes.

The combination of these two interests greatly increases the responsibility of the manager, and he finds that he must not only keep himself posted in all that pertains to gas, but electricity as well.

In conclusion, I desire to express my gratitude to the Directors of this Association in remembering me and in requesting that I contribute a paper. If in what I have said there may be any good or interest derived, then I shall have been amply repaid.

The paper was not discussed, and, on motion of Mr. Slater, the thanks of the Association were voted to Mr. Pratt.

Mr. A. B. Slater, of Providence, R. I., then read his paper, entitled

WHY I SHALL MAKE WATER GAS.

About the 10th of January I received from our gentlemanly Secretary a note, in language so dignified, so courteously entreating, so earnest, and at the same time so pathetic, that I was left no alternative, no option, but at once I felt impelled to accede to his request and prepare a paper for this meeting which, if it contains nothing new or instructive, may at least serve to amuse you for a few moments. He did not assume the responsibility of selecting the subject, but placed it upon "some one of the Directors," who had suggested as a subject for me to write upon, "Why you went into water gas."

Of course I have no knowledge, or even the least intimation, who this Director is; but, whoever he is, he must be a man of courage, and I ought to be a man of still greater courage to come before this old orthodox New England Association of Gas Engineers with a subject about which so much has been written and said, and which has occasioned so much, may I say bitter, controversy between its promoters and the older gas engineers and managers as this same subject, water gas. To attempt to go over this long controverted ground, and direct your attention to the feelings of hostility and even bitterness engendered by the early introduction of water gas, and the persistent energy displayed by its promoters in experimenting and perfecting apparatus which would overcome the difficulties and troubles encountered for many years upon its first attempted introduction upon a practical scale, would be to write a volume. To the older members of the Association this is all quite familiar, and the younger members can spend their time more profitably in studying the conditions of things as they exist to day.

I will say, however, in passing, that in my judgment the feelings to which I referred, of opposition to water gas, etc., etc., were not engendered so much by the gas, or its composition *per se*, as by the aggressiveness displayed by its early patentees and advocates in forcing its introduction by questionable methods, even before it had reached its present perfected state, which is almost wholly due to improved apparatus for its manufacture. The objection to carbonic oxide by and of itself is just as forcible in principle and theory to day as at its first introduction. By itself it is just as virulent a poison now as then; but then no gas company does or purposes to send out to consumers carbonic oxide alone, and I am not aware that carbonic oxide has ever been recommended for breathing purposes; but as one of the component parts of the finished gas it really is of advantage, as it produces a high flame temperature, and consequently more perfect combustion than straight coal gas does; and when we come to look at it and carefully consider the facts as they now exist, the question of carbonic oxide practically drops out of sight.

You say at once, "Why?" My answer is, simply from the fact that with the exception, I think, of but two States of this great country, the State and municipal authorities without opposition permit water gas to be made and distributed to consumers.

When we know that by far the larger portion of the gas made and distributed in most of the larger cities of this country is water gas, and with practically no objection on the part of the public, the question is at once reduced to the simple matter of dollars and cents; and the sooner we recognize this fact the sooner we will place ourselves in a condition to take whatever advantage there may be in location, prices of material and labor, cost of construction, or any other conditions which can be secured by its adoption.

The question of quantity and quality of light given by water gas is no longer a mooted one. Again, if compared with the dangerous electric current, which you can neither see nor smell, the question of carbonic oxide, when considered in connection with illuminating gas, is really eliminated. But if applied to the distribution of so-called fuel gas, containing 45 per cent. of carbonic oxide and almost odorless, the old objection is at once revived in all its earnestness. With all the attending dangers, people will take electric light, natural gas, and what is least dangerous of all—and then mostly through gross carelessness—water gas.

The question of the disposal of the residuals (especially coke and tar) of a large coal gas works is one which occupies a prominent place in the consideration of the policy of adopting water gas, either wholly or in part, as on the net receipts for residuals the net cost of coal gas very largely depends. When a company is so situated as to be able, profitably, to make water gas instead of coal gas, it relieves the manager or superintendent from the labor, care, annoyance, and trouble of the disposal of residuals, which matter is quite a burden in a large coal gas works. The question of the cost per thousand feet to manufacture coal gas or water gas depends almost wholly on the relative prices of gas coal, enriching materials—such as cannel coal, crude oil, naphtha, etc.; cost of material used in generators, prices at which residuals can be readily disposed of, prices paid for labor, etc., etc.

As applied to the company which I have the honor to represent, I recommended the adoption of water gas as an auxiliary to our coal gas plant, for several reasons, among which are: First, based upon present prices, a material saving in the first cost of the gas; second, by combining the two systems, we can make a small saving in the cost of our coal gas, because we can run our coal gas plant more economically; that is to say, we can keep fired and use continuously, without missing charges, such number of benches and keep employed such number of men as we can keep at work to the best advantage, and make up any excessive variations in the demand for gas, with the water gas plant; third, we shall make less coke to be disposed of, and at the same time be our own customer for a considerable portion of what we do make, thus effecting a saving on that residual; fourth, we shall make less tar, which we have not been able to dispose of at remunerative prices; but the lessened quantity will net us about as much in the future as we have heretofore received for the whole. The large quantity of water gas now made in our large cities has very materially diminished the quantity of tar heretofore made, so that the price of this residual is already being considerably advanced. Fifth, the question of labor is an important one which enters into the consideration of this question. A good water gas plant can be operated successfully with one-quarter to one-third the labor that is necessary in a coal gas works. This reduces the risk and annoyance consequent upon strikes or trouble with the men employed; and, finally, we intend to keep our coal gas plants up to the times as far as practicable, and with the addition of a respectable sized water gas works of the latest design and construction we are in a position to secure all the advantages of both systems, either alone or together, according as the price of material and other items of cost may seem to make it advantageous to do so.

The President—I think that before proceeding with the discussion of this paper we will listen to the paper on a kindred subject, by Mr. F. H. Parker, of Burlington, Vt., and then the two papers may be discussed together. In the absence of Mr. Parker, the paper was read by Mr. W. A. Wood. The paper bore the heading—

A FEW OF THE ADVANTAGES OF WATER GAS OVER COAL GAS FOR SMALL WORKS.

The works of the Gas Light Company at Burlington, Vt., were built in 1853, and were run as coal gas works until 1880. At the time the writer took charge (Jan. 1, 1877) the retort house contained four benches of 5's and one bench of 3's, that had been erected with new arches, hydraulic main, exhauster, condenser, etc., in 1874, and were probably at that time as complete works of their size as could be found in New England. Westmoreland coal was used, costing, delivered at the works, $5.70 per gross ton. The best average yield obtained had been 4.77 feet per pound, and gas was sold at a net price of $4 to $4.28 per 1,000.

It is, perhaps, superfluous to remark that the consumers were not satisfied with the price of gas, and as the stockholders were unwilling that dividends should be cut down, a change of some kind was demanded. Quite a supply of tar had accumulated, and it was used as fuel under the retorts. The average yield of gas increased to 4.86 per pound. Some more coke was sold, and the net price of gas was reduced to $3 and $3.60 per 1,000, in the hope that the consumption might be increased. The effect was quite the reverse; for this reduction apparently served to remind consumers that they had been paying a high price for gas, and stimulated them to economize in its use, and the annual sendout decreased. As there seemed to be no further economies available towards cheapening coal gas, the Lowe process was adopted, is still in use, and the price of gas has been gradually reduced, the present net price being $1.60 to $2.25 per 1,000, and the amount of gas sent out last year was 10,000,000 cubic feet.

Having had rather an intimate experience with coal gas for 3 years and with water gas for 10 years, the following comparisons suggest themselves.

Among the disadvantages connected with the manufacture of coal gas

I recall to memory the very interesting experience with naphthaline; the abundance of limpid tar and tar that was not limpid, the piles of coke for which there was no sale when you wanted to get rid of it, and for which there was such a remarkable demand when you had none to spare; the interesting spectacle of stopped stand-pipes and of retorts with holes in their sides or too much carbon in their interiors, that collapsed just before you were ready to let them down, and had to be replaced at large expense; the services that always froze just as you were starting for supper; the drips that filled just when you could spare no one to pump them; the fires under the retorts that required careful attention night and day; the retort house and its inmates, never clean—the very thought of a strike, or a stoker drunk, sending chills all over you; and, in fact, a life of continuous anxiety and worry. But enough—many of you have been there, and are there now, but are doubtless praying for a brighter hereafter.

I allude, of course, to the experience of the superintendent of small works—one who, as friend Chase says, has the opportunity to become familiar with everything, from a Stillson wrench to a stock ledger; who, from the earnings, is expected to keep the plant in good repair, make all ordinary extensions and pay regular dividends, and yet sell gas at a price but slightly more than is obtained in the larger cities.

Those of you who do not recognize anything familiar in these reminiscences, and who have not been so fortunate as to be connected with a small works where the cold of winter equals that of northern New England, where you may expect 6 feet of frost every winter, little realize the joys you have missed.

On the other hand, with water gas naphthaline is unknown; you make comparatively little tar; coke does not appear upon the premises; you have but one stand-pipe to stop up, and that you clean occasionally when it suits your convenience; retorts and their lids do not trouble you; hydraulic mains full of pitch exist only in memory; services seldom freeze; but very few drips require any attention; you require less help; you make gas at whatever time of the day or night it suits your convenience, due regard being paid to holder capacity; you can thus avoid making gas in the heat of the day in summer, or make once in two or three days as necessary, and have your help in the meantime for other work; you do not require a large stock of materials on hand; your repairs are insignificant and unfrequent, and an occasional coat of paint or whitewash keeps your generator room bright and clean; and upon one occasion a certain individual was seen running our apparatus while attired in a dress suit—yet that is not, strictly speaking, our regulation costume.

The very marked odor of carbureted water gas makes the detection of leaks easy. We have thus been able to stop some that with coal gas were for years unsuspected, and, therefore, to steadily reduce our leakage.

The numerous barrels of brine that were required to be pumped into the mains to keep them clear in winter, when coal gas was made, are no longer a familiar sight upon our streets; and yet I freely admit that whether coal gas or water gas is made, if all trouble from frost closing or breaking mains or services is to be avoided, it can only be obtained by protecting them or by placing them below frost.

We are enabled now to use experienced men from the works to put in services, lay mains and repair leaks, while, when making coal gas, they were so closely confined that we had to rely upon whoever could be secured, as we did not have sufficient work of the kind to warrant keeping any one regularly employed for that purpose.

The rapidity with which water gas is made enables us to send out double our holder capacity each day, if necessary. One man has frequently made, with a generator 5 by 10, outside, 70,000 cubic feet per day, and averaged last season 41,000 cubic feet per day for nine weeks, preferring to do the work alone, as he expressed it, rather than be bothered with green help.

In making these comparisons I don't wish to be understood as claiming any superior results obtained over others working similar processes. On the contrary, I should be much surprised if others, using more modern apparatus, or working under more favorable conditions, do not excel us. We labor under the disadvantage of having a small consumption, considering the extent of our mains, and a small average consumption per meter, as we have comparatively few manufactories.

Neither do I wish to be understood as conveying the impression that water gas works run themselves, or that the position of manager of even a small works is a sinecure. With us life is not always monotonous. Our dear public, like yours, is always demanding more for its money, and the days are very rare when opportunities are not presented to us of combining an abundant amount of practice with our theory.

Discussion.

The President—You have heard two papers, one written by the manager of a works producing 460 million cubic feet, and the other written by the manager of works producing 10 million feet, between which limits, with a single exception, I have no do doubt that most of us come. I would like to have a good discussion of the subject. Mr. Prichard was an early advocate of water gas, and had one of the earliest plants. We would like to hear from him.

Mr. Prichard—We have used a water gas plant with considerable advantage, at times when we were working the retort house to its full capacity, and used that to make up the irregularities of consumption. For that purpose it has served us very well. But, in the matter of cheapness, at present prices it is a question which of the two it is better to use.

The President—Mr. Humphreys has been busy for a year putting in a water gas plant, and perhaps he can tell why he did it.

Mr. Humphreys—I put in a water gas plant because I am supplying gas in a mill city where our consumption is very variable. In very dark weather our consumption will increase 100,000 feet per day over a bright day; and to meet that varying demand with coal gas works is very difficult. It is necessary either to keep a number of extra retorts under fire, or to make up all deficiencies on bright days; and while the latter course will work well enough if you have but a couple of dark days in a week, it will not work if there are five or six of them following each other. Since I have been in Lawrence, before the water gas plant was put in, I have stood by the holders many a day when it seemed as if I grew ten years older in the almost impossible effort to keep the holders up. Then, again, I regard the water gas plant as a cheap means of increasing the candle power of gas. Our idea is to make a water gas of about 28 or 30 candles, and to use that for enriching without the aid of any cannel coal. We have done this, using part coal in our generators, and we are now reaching the point where we hope to do it by using coke alone. That is the point we are aiming for—to use our coke from the coal gas works in the water gas plant. With regard to the question of price, which Mr. Prichard refers to, I would like to ask him whether he uses crude oil. In our works that we have we use Lima crude oil; and with that oil I have no doubt that we can make a gas at a lower figure than we can by the coal gas process. I am inclined to think that Mr. Prichard has not used Lima crude oil.

Mr. Prichard—That is just exactly the point. I have one of the old style of Granger works, with shallow generator and single superheater, and it is impossible to use Lima oil without sending the vapors of the oil all over the town. It has caused considerable talk, and so we only use it (the Lima oil) when it is absolutely necessary. If we use naphtha we get along much better. The comparative prices of the two with us, where we have to team the oil to the works, is about 6 cents for naphtha as against 3 cents for oil. You can readily see that what would be economy at 3 cents for oil might carry the balance the other way at 6 cents.

Mr. Harbison—I would like to ask those gentlemen who have had experience in the use of water gas as an auxiliary to a coal gas plant, what change they are obliged to make in their coal gas plant, if any, in order to use water gas in connection with it, and whether they have to have an additional holder; and, if so, how they manage it. I would like them to answer these questions, so that the rest of us who may be considering the question of putting in a water gas plant as an auxiliary may understand what we have to introduce more than we now have.

Mr. Slater—As far as we are concerned, I may say we have made no changes, with the exception of making the connection direct from the generator to one of our holders, which is about 280,000 feet capacity. We go directly from the generator to that holder, and draw the gas from that by an exhauster, and send it through the purifiers of the coal gas works, the same as the other gas. There are no other changes.

Mr. Harbison—I would like to ask Mr. Slater if he knows what proportion of each gas produces the best illuminant?

Mr. Slater—We have not reached that point yet.

Mr. Anderson—I would like to ask the question, with relation to water gas, if there is anything very noticeable in relation to condensation taking place in the meters; and if the meters have to be re-diaphragmed any oftener because of burning water gas.

Mr. Prichard—We do not notice any difference, but I should suspect that if we kept on sending vapors of oil about the town we would have trouble from it.

Mr. Anderson—The reason I ask that question is this: In a room yesterday where meters are repaired I saw a number of meters in which there was considerable condensation. I made some inquiries, and found out that they had been used on water gas; and I was told that such meters had to be re-diaphragmed very often. There was one 250-light

meter there out of which was taken at least 5 gallons of a sort of resinous tar. I have a piece of one of the diaphragms, which is very brittle. The life of the leather is all gone, and for the purpose of examination I will leave it on the table.

Mr. F. H. Lane—I have been using water gas for several years, and I would like to get some facts, from those who have had experience in the matter, as regards condensation.

Mr. Shelton—I am in a particularly good position to know about the effect of water gas on meter condensation, from my connection with the United Gas Improvement Company, of Philadelphia. We have watched that point very closely, because it has been one of the points urged against water gas—that the life of the meter was shortened, that there was more condensation, and points of that nature. The whole thing in a nutshell is this. There is water gas and water gas. If water gas is properly made and thoroughly fixed you will have no trouble from that source. I grant that on some of the older forms of apparatus (one such is within a hundred miles of this city) you can take out a meter, disconnect it, turn it upside down, and get probably half a pint of the matter of which Mr. Anderson speaks. But I will make the prophecy that that apparatus was built ten years ago, has an extremely small superheater capacity, and is not in good shape to take care of the naphtha used, to say nothing of crude oil. The experience of our Company in the different works we operate is that we have to keep close watch on this point. We have compared the records of the drips on the streets, and also the meter reports, since water gas has been made with the back records when coal gas was made, and those statistics show that the effect upon the meters and upon condensation can be taken, to all practical intents and purposes, as just about the same, provided the gas is properly fixed and made with modern apparatus of fair efficiency. I do not mean the apparatus for making water gas of twelve years ago.

Mr. Jones—Mr. Slater in his paper remarked that there were but two States in the United States where prohibitory statutes relating to water gas are in force. May I ask to what State, other than Massachusetts, he referred?

Mr. Slater—I did not refer to them as prohibitory, but simply as States having a carbonic oxide law. I referred to Massachusetts and New Jersey.

Mr. Jones—In the State of New Jersey the law relating to carbonic oxide limits it to 2 per cent., which practically precludes the manufacture of any kind of gas.

Mr. Slater—That refers to new companies.

Mr. Jones—If that law were enforced to the letter it would preclude the use of cooking stoves in living apartments. I understand, with Mr. Slater, that that law refers to new companies organized since the passage of the law, ten years ago.

Mr. Humphreys—I want to say a word in answer to Mr. Harbison. He asked what changes were to be made at works when putting in a water gas plant. We happened to have a couple of small holders, of 20,000 feet capacity each, and we have used those as "relief" holders—making our gas into those holders, and then exhausting it back and putting it through the regular condensers and purifiers.

Mr. Coggshall—I would like to ask Mr. Humphreys what percentage of his whole product is water gas.

Mr. Humphreys—We are using about 12 per cent. of water gas now.

Mr. Harbison—Is Mr. Slater using naphtha or oil; and how many gallons per thousand feet of water gas made?

Mr. Slater—I use Lima oil, but I cannot state any definite quantity as yet. We are not running the water gas plant to its fullest capacity, but simply running it occasionally; and are using from 3½ to 4½ gallons.

Mr. Harbison—How does that agree with Mr. Humphreys' use of oil?

Mr. Humphreys—We are using about 5 gallons.

Mr. Stiness—I am glad to learn that the world moves. If a few years ago a man who occupies the position of my good friend Slater had spoken within the presence of this New England Association and told us why he made water gas, the very arch fiend of Sheol would have been considered pure and white in comparison. But I am very glad that he has given us such a very concise paper. It is in his usual strain, leaving no chance for argument. He argues the points himself. There are no criticisms to be made upon it. I move that a vote of thanks be tendered to Messrs. Slater and Parker for their papers.

Mr. W. H. White—May I be permitted, although a guest, to second that motion, and to say that I antedate brother Stiness; for I remember that (whether through the courtesy of the members of this Association, or through their fear of a double-edged tongue) I was the only man, for some years, who was permitted to speak of water gas in the New England Association without being immediately clubbed by the chair. It fills me with a great deal of pleasure to know that the road in which we trod many years ago, then unmarked by the single footprint of a regular gas engineer, is now crowded, and that you are pushing one another over the edges of that road in your efforts to accomplish the good which I then foresaw. I most heartily second this motion, and most heartily welcome to the ranks in which I then stood, a lonely apostle, brother Slater.

The President—We are glad to welcome brother White, although he speaks of being a guest, as a participant in our discussions. I wish that every guest here would manifest the same interest that he has. I trust that all will join in the discussions without being individually asked to do so. We bid you all a welcome here in good earnest.

The thanks of the Association were then voted to Messrs. Slater and Parker for their papers.

Mr. H. A. Norton, of Boston, Mass., then read his paper on

VARIOUS METHODS OF INTRODUCING GAS STOVES.

Mr. President and Gentlemen of the Association: It was with reluctance that I accepted your Secretary's request to prepare a paper on a subject so near to me, knowing that you come to the convention to listen to gas engineers. Therefore, I have prepared this paper from material given me by members too modest to proclaim their own success in this direction. It is worthy of note that nearly every apparatus used in connection with the gas business has been remodeled or changed to suit the surroundings in which it has been placed, and to the gas engineer the credit of successful results must be given.

So it is and must be with the introduction of gas cooking stoves. No one rule can be given to bring about the desired result. The engineer should study his plans for introducing gas stoves as he would his plan of mains for distributing gas. The liberal policy pursued by most companies to-day makes the way towards acquainting their consumers with the merits of gas stoves easier. Where stoves are leased or sold below cost, the outlay of money used for that purpose should not be looked upon as too great for the return received that year, but as a permanent investment yearly bringing in a large interest.

They are consumers for life, and in a time and season when most appreciated. The different methods of introduction I shall speak of have accomplished their end to the satisfaction of those presenting them; and while there may be still better ways, let the introduction be not formal, but one that will surmount the barrier between gas companies and consumer, and make the latter feel that he was prejudiced in his supposition.

I speak, first, of leasing stoves; for that method is more popular with the majority. To lease any needed article on approval meets with favor; for the idea of a trial, at a fair investment on the principal, entices the most wary. Once let them take a gas stove as an experiment, then you have completed your task and have a willing captive. Of course, the desired result is to sell the stove, and this is, I think, the most successful method.

The companies leasing stoves charge, and readily receive about 25 per cent. on the price of the stove, all rentals being due the first of each May, thus making the matter of collections easy; and nearly all companies allow at least one year's rent to go towards the final payment when the sale is made.

The companies who sell their stoves outright allow the consumer a fair trial; and while it is a distinction without a difference I am sure, from my own experience, better results can be obtained from leasing. In either case, whether leased and effectually sold, or sold outright, the gas companies should sell at what seems at first thought a loss.

Take, for instance, the supposition, and it is a reality, of putting out 1,000 stoves a year. They would cost from $16,000 to $20,000, depending upon the size of the stove. This includes setting up, rent of stoves, salesman or clerk, and advertising.

Take as a basis for a few figures the cost at $18,000. They will average to consume yearly 10,000 cubic feet of gas, making ten millions cubic feet per annum. Placing the profit at 50 cents per 1,000 cubic feet, which I think is low enough, the profit on gas consumed by 1,000 stoves would be $5,000 each year.

Were you to lease the stoves at 25 per cent., your income from that source would be $4,500, making $9,500 yearly income, 52.7 per cent. interest on your investment.

Were you to sell the stoves at a loss of $5 each, your income from gas sales would just offset that loss the first year, and bring your investment to $13,000, upon which you would yearly derive 38.46 per cent. interest. These figures are given for your perusal, and especially for the smaller companies who feel the more heavily the loss made by electric lighting.

They can figure a smaller number of stoves pro rata, and are in some

respects better situated for the introduction of gas stoves. Of the practical results I have nothing to say, as every gas engineer knows them, and a fair trial by their consumers is conclusive. The methods of advertising are various, and must at first be pushed, for you have goods for sale and you must be more than a "Barkis" to your consumers.

Some companies have canvassed each house consumer with good results. Many have used the cooking schools to advantage, had the teachers lecture to their consumers, giving a practical demonstration of the results, and every company should have a salesman or clerk thoroughly conversant with their uses.

The inducement offered by some companies, by reducing the price of gas for manufacturing and cooking purposes, is commendable when circumstances prevent the reduction being made to all; and it takes but a survey of the gas stove field to see that low-priced gas is a prime factor.

In the discussion let me refer those whose efforts ten or even five years ago were unsuccessful, and who lament that theirs is not a gas stove community, to their more successful brother engineers, and urge them to make another effort, aided by others' experience, with a reduction in the price of both gas and stoves.

Discussion.

The President—In the discussion of that paper we shall be glad to hear from all those who have put out gas stoves largely within the past year. I think that Mr. Slater has rather carried off the palm for his method of introducing stoves, or rather by his ability in doing so. I will ask him to give the results of his experience in the introduction of gas stoves in the past few years.

Mr. Slater—We commenced the gas stove business three years ago next June. Our idea was to place the stoves, either by sale or by lease, or in any way that we could induce a consumer to take them; and for the reason that those who have sold gas stoves in Providence heretofore made it a special business, and expected to make something out of it, and did not meet with any great success, we determined to sell them at about the cost price. When we started in our point was to sell the stoves at what they cost us, or lease them at a moderate rental, and so place them within the means of the consumers, and thus induce them to try the stoves, knowing very well that when they once got a stove and used it they would not again be without it. The result was that during the first year we put out some 500 or 600 stoves; and during the last year and a half we have added still more to that number. I think that the most we put out in any one month was 310, in the month of June last. We now have more than 2,600 gas stoves in use; and I should say that the 2,600 stoves would not consume less than twenty million feet per year.

Mr. Allyn—Do you make a special rate for gas used in cooking stoves?

Mr. Slater—The same price as for other purposes.

Mr. Harbison—Can you state about what proportion of stoves are leased and sold?

Mr. Slater—Somewhere from two-thirds to three-fourths on the number of stoves in use are on lease. We find that many who take stoves on lease will afterwards purchase them. After having paid rent for one or two years, if they see fit to pay the balance of the cost of the stove, and own it, we allow them to do so.

Mr. Harbison—Do you find any difficulty in re-leasing a stove that has been once used to another family?

Mr. Slater—None at all. We take it to the shop and clean it up, If the customer wants to buy a stove we let him have a new one; if he wants to rent one we let him have one of those that had been used.

Mr. Harbison—What is your price for gas?

Mr. Slater—At present, $1.40.

Mr. Harbison—Have you a special department for the stove business? Have you canvassers?

Mr. Slater—We have no canvassers. We have a store on the main street, and make a special department of the stove business.

The President—I find that gas stoves have been introduced successfully in most of the larger towns and cities. Have any of our friends tried them in the smaller towns? Does it pay to introduce them in the smaller towns? I think that Mr. Todd can tell us about that.

Mr. Todd—The plan which I have adopted is that of having a free lunch. My reason for adopting that plan was because I found, when I went to Middletown, N. Y., that the gas cooking stove was very little known. I hired an empty store on the principal street, and put into it all the different kinds of cooking and heating stoves that in my judgment were the best. I set them all around the place, made the store as attractive as possible, and hired a lady to cook. I had a table spread, and all who came in were welcomed to help themselves. The free lunch and exhibition continued for four days. The first exhibition was two years ago. We found that a good many who came in to see the stoves would ask, will it do this, or will it do that; and we found that the best way of convincing them of its capabilities was to show them by an actual test just what it would do. Last year I did the same thing, and intend to have another exhibition in the month of May. As I have said, when I went there, the gas stove was unknown; but in two years I have put out over 80 stoves; and next year I expect to put out nearly as many more. When people inquire about them, I show them the stoves, and what they will do, and tell them that I will set one up free of cost, and that if, after a fair trial, they do not like it, I will take it out. I give each one a stove on trial for one month. If they do not like it, I take it out, and charge nothing for setting up or taking out, but as a matter of fact I have had to take back but one stove yet. We dispose of the stoves to consumers by selling them at cost, or renting them. The rental is twenty per cent. rent on the net cost, and if the stove is afterward sold to the party who has rented it, the amount paid as rent is allowed on purchase price.

Mr. Slater—We hire a store and pay $1,800 rent per year for it, and have a good man to run the store, and we sell the stoves at cost and set them free of expense; so that you see what a profitable business we are making out of them, as far as that goes.

Mr. Harbison—Do you add the store rental, the salary of the man and the cost of making connections to the cost of the stove?

Mr. Slater—That has nothing to do with the rental at all. Our object is to get the consumer to the use stoves and burn gas.

The President—I would like to ask Mr. Goodwin whether in his experience in the gas stove business he has found any difficulty in introducing gas stoves in small places, as compared with larger towns.

Mr. Goodwin here stated his experience in the introduction of gas stoves; but at his request his remarks were not reported.

The President—I think Mr. Harbison has also had some experience in putting out gas stoves, and we would like to hear from him.

Mr. Harbison—The gas stove business has been an important factor with the Hartford Gas Company for a number of years. We have had a satisfactory degree of success thus far, considering the efforts that we have put forth. Our efforts have consisted wholly in having the stoves of different makers on hand, posting ourselves somewhat with regard to their capabilities for doing the work claimed for them, and by personal solicitation and representation of their merits to the people of Hartford in inducing them to buy the stoves. We have no faith in the system of giving away stoves. As is well known to most of the gentlemen present, we sell gas at the low rate of $1.40 per thousand feet to the general public, and just now at even a lower rate than that to large consumers who use it for mechanical purposes—the rate depending upon the quantity they use—so that in some cases we are selling gas as low as $1.25 per thousand feet. We have more than one stove in use for every four meters in the city of Hartford. Our output of gas between seven o'clock in the morning and five o'clock in the afternoon (which we call the day consumption) has been during the past year more than twenty per cent. of our entire output. We attribute the larger proportion of that to the use of gas in cooking stoves. We never have had a stove that has failed to do all that we represented it would do, when we sold it. We sell a stove with the proviso that if it does not do as we represent it will, we shall take it back and refund the money paid. We sell stoves at what it costs to deliver them at our works in Hartford. We charge the cost of making the connections. We have only one step more to take to become a strictly benevolent institution; but we do not take that step by giving away anything. Our customers are well satisfied with the stoves. We have no extra expense in connection with carrying on the business, because the labors of the men who set the stoves are paid for by the parties who buy them; and the stoves are sold in the office by clerks who are employed to do the clerical work of the office. Two or three of the clerks are well posted with regard to the merits of the stoves, and if one is not ready to attend to a customer, another one can. The only serious difficulty we have is with the cost of the stoves; and that objection is gradually being overcome by manufacturers making from time to time a small concession in price. As they increase their business, they come down a little on the price, which is very gratifying to us and pleasing to those who want to buy stoves. We are sure that continued reduction in price will increase the sales of stoves, so that the profits of manufacturers may be in-

creased by means of the largely increased business which will naturally come from the reduction of prices in stoves, just as a gas company increases its net income or profit by the largely increased business which results from a reduced selling price. The same principle applies in the manufacture of stoves as in the manufacture of gas. A large increase of business increases the net income, because the general expenses are not increased in proportion; and large sales at small profits increase the bank account. We make no profit on the stoves, but we do on the gas which is burned in them. We now have about 1,700 stoves in use in Hartford. During the past year we have seriously considered the question of putting at work a canvasser for the sale of stoves—every house in the gas district shall have a stove. We have more than 75 miles of mains in our city, and we think that by thorough canvassing, we can increase the sale of gas by a more general introduction of gas stoves, and that the increased sale of gas will compensate us for the additional expense. But we have not yet found the right party to go to work at the canvassing. It requires a party of some brains and intelligence, and of some little persuasive ability in talking, to act as a canvasser; and good canvassing agents are very hard to find. When we do find the right man, we have a job for him by way of experiment, if nothing more; and if he makes a success of it we will make the position permanent. I think it will pay every gas manager to give attention to the stove business; and he is very much better qualified to do so than any outsider who has no interest in the business except the profit which he can make by the sale of stoves. The business of the gas manager is to make and sell gas; and he ought to devote a certain proportion of his time, ability and intelligence to making that selling feature of the business prominent. It pays as well as any part of the business.

Mr. Woodward—Our experience has been very much like that of Mr. Harbison in the matter of leasing stoves. We found when we used to lease stoves (a practice which we have discontinued) that when our stoves came back again, we could not sell them at anything like their cost. On that account we discontinued the practice of leasing stoves, and now only sell them. We have been quite successful, and have about 250 stoves in use. Last year we gave away 50 small stoves; but I think there is some question whether that is a good policy, because it stops people from getting a larger stove which can do a great deal more work. I would like to know whether any others have had experience in the matter of giving away stoves; and, if so, how it compares with mine?

Mr. Neal—There is one objection to the use of gas stoves in place of ranges in the kitchen. Perhaps that difficulty has been obviated, but I do not know that it has. I refer to the difficulty of furnishing hot water for washing purposes. For instance, in my house in the summer time we use one of these stoves or ranges, but on Mondays there must always be a fire made in the coal range, because there is no other way of heating sufficient water for general washing purposes; nor have we any means by which we can heat water for use in the bathroom. That fact has been urged as an objection to the use of gas stoves in place of ranges—that when it is necessary to have hot water for general purposes, the fire must be made in the range. I would like to ask Mr. Norton if, in the sale of his stoves, he has any arrangement by which water can be economically heated by gas for the purposes I have mentioned.

Mr. Norton—None of the stoves have a regular hot water back. The stoves are used lagely in summer time, when very little hot water is needed; but for Monday's washing, the people generally do as Mr. Neal states—light their coal stoves once a week.

Mr. Harbison—The difficulty stated by Mr. Neal is very easily overcome. Almost all gas stove manufacturers make a hot water generator which will do the work of heating water as thoroughly as the stove will do the cooking. There is no difficulty whatever about it. One of our citizens wanted to overcome that very difficulty, and we told him that the hot water generator would fill the bill. We guaranteed what it could do—having the maker of the generator to back our guarantee, he having told us personally what he claimed for his hot water generator, and stated that he would back it to do as he said, or respond for any loss or damage. Knowing that he was a responsible man we had no hesitation in repeating his statement. That generator we furnished and it was not to be paid for until it had fulfilled the conditions under which it was sold. The purchaser subsequently expressed himself in the most thorough manner as satisfied with the performance of the generator and promptly called for and paid his bill. That was the first generator which we sold. We have had no hesistancy since that time in recommending them, and in promising that they will give as good satisfaction as the cooking stove or range gives. You can have hot water for washing on Monday or on any other day of the week; or for bath purposes, or for any other use for which you want hot water.

(Further remarks were here made by Mr. Goodwin, which are omitted at his request.)

On motion of Mr. Harbison the thanks of the Association were voted to Mr. Norton.

The President—We will turn now from the discussion of hot water to another problem which may get us into hot water. The question of how to run a gas works and an electric light plant together. Mr. S. J. Fowler, of Westfield, Mass., here read his paper on the

MANAGEMENT OF A SMALL GAS AND ELECTRIC LIGHT PLANT.

The problem of how to run the electric department of a gas company so as not to lose money and so that the department shall pay dividends or interest on the money invested, is, I find, intricate and consequently interesting, and I hope so large a proportion of this audience is interested in the problem that my solution of the matter may not be unwelcome to you.

In its gas business our company has always pursued the policy of never making any private contracts. Our terms are public, and every customer can know what rate any other customer pays for gas. The same policy we try to carry out in our electric business. We do not believe in making one party carry the burden of capital charges and taking another customer at simply manufacturing cost. We are located in a town the closely settled portion of which contains probably about 7,000 inhabitants. We have a six-inch gas plant, with two benches, one of threes and one of sixes. There is nothing meriting especial mention about our gas works, except that, with the pressure of 100 lbs. on the town water mains, we use a water-jet exhauster, and have done so for the past ten years to our perfect satisfaction. Our make of gas for the last year was very close to 7,000,000 feet. Our price is $2.50, with 5 per cent. off for prompt payment and an extra 5 per cent. off to consumers using more than 50,000 feet during the calendar year. We furnish about 300,000 feet for a gas engine at $2.00 per 1,000. The State report of 1889 makes the average price of our gas to be $2.34.

We bought out the local electric light company in the autumn of 1887, but, finding the plant as sold to us, entirely inadequate to our needs, we abandoned it, with the exception of its electric apparatus and built a brick station, 96 feet by 36 feet, one story high, with a high basement under the engine and dynamo room. Our boiler room is 36 feet by 32 feet, and contains two 54-inch return tubular boilers, of 70 horse power each, built to run at 125 lbs. pressure. The brick stack is 80 feet high and 4 feet square internally.

In our engine and dynamo room, which is 64 feet by 36 feet, are one 70 horse-power McIntosh & Seymour compound condensing engine, connected to two 30-light 9 ampère Schuyler, arc machines for street lighting, and one 100 horse-power engine of the same make and style, connected to one 45-light 7-ampère Schuyler dynamo for commercial lighting, and to one 500-light Thomson-Houston alternating incandescent dynamo. The remainder of the space in the engine and dynamo room is utilized as storehouse, workroom, etc.

In the basement is the condenser, which is supplied with water from the river, about 275 feet distant.

We had run our original electric plant long enough to be assured that there is no bonanza in the electric lighting business at the prices charged by our predecessors, and which seemed to us as high as our customers could afford to pay. We had, therefore, to look to increased business and a proportional diminution of expenses for our profits.

Our prices for electric lights are as follows:

For our street lights we get $82.18 per year, or 22½ cents per night, for a 9 ampère lamp, running every night from 20 minutes after sundown until one A. M.

According to the report of the Gas and Electric Light Commissioners of last year this was the cheapest service given by any company in the State, and I have no hesitation in saying that the price is less than it should be to meet the proper charges for interest, repairs and manufacturing expenses.

For our commercial arc lamps we get $100 per year, less a discount of 5 per cent. for each regular night in the week when the lamps are not used after six o'clock.

As a Gas Company, and in the lighting business to stay, we did not believe in a uniform rate per lamp, regardless of the number of hours burned. We therefore made a schedule, from which I select the following:

No. 1.—$7.80	per	year,	1	night	in	the	week,	until	9,	1 until 10, 4 until 6.	
" 2.—$12.00	"	"	5	"	"	"	"	9,	1	"	11.
" 3.—$13.80	"	"		"	"	"	"		6	"	11.
" 4.—$15.00	"	"	every night until 11.								

The first rate is equivalent to 1¾ cents per hour. The second to one cent per hour. The third to ¾ of a cent per hour, and the last to a little over ¼ of a cent per hour; so that it is very plain that our charges are much lower per hour for long hours than for short ones.

Our lamps average us nearly 95 cents per month.

We have now wired:

On our street dynamos the equivalent of 63 arcs.

On our commercial arc dynamo the equivalent of 26 arcs.

On our incandescent machinery the equivalent of 330 16-candle power lamps.

Our commercial dynamos are run from early dusk until eleven o'clock every night, except Saturdays, when we run until half-past twelve. I am sometimes asked why we do not run later every night. My answer is that we cannot afford it. We should not have more than 15 or 20 lamps on the line after eleven, and any additional revenue we might derive from them would not pay for the oil used on the engine. The same is true of day service. Undoubtedly this policy of stopping rather than running longer at a loss has cost us some business and decreased our revenue somewhat, but it has lowered our expenses.

Except the first year that the electric light was introduced our increase in gas consumption has been about 8 per cent. per year, and we do not feel that electricity has damaged our gas business in the least.

During the last 18 months we have added about 60 per cent. to the output of power from our electric station.

The increase in our gas business has thus not been at the expense of our electric business, nor has the increase in our electric business been at the expense of gas. The two run along side by side, and, except in a few cases, do not compete; but the growth of both branches is made in new business and also by driving out kerosene oil.

For street lighting it is now generally admitted that arc lamps supply the popular demand for light better than anything else. We have on our streets 49 arc lamps and 6 Sims 25-candle power incandescent lamps, and our streets are illuminated to the general satisfaction of the citizens.

We have no public gas lamps, except 15 on the main thoroughfare of the town, which burn from 1 A. M., when the electricity is turned off, until morning.

For inside lighting arc lamps are in use in certain places, but in our small towns, where there is not a great extent of mercantile business, the cost—the necessary cost—is practically prohibitory to many of the business men, and, therefore, the arc lamp cannot be generally adopted, even if it were in all cases advisable.

The incandescent lamp and gas are our other means of supplying our customers, and it is of the relation of these two commodities that I wish particularly to speak.

Gas pipes are put into almost every building and customers supply their own fixtures, so that in connection with the use of gas the company is put to no expense beyond the running of the service and the setting of the meter.

For electric lighting our company does all exposed wiring, etc., free of charge, the only cost to the consumer being the lamps, which we sell at cost price. We believe it is a good thing for us to own the electric material in town, wherever it may be, as we thus have the right to take it away or change the wiring as we may desire without any great protest. I may add, however, that we chose to do free wiring when we put in our incandescent plant, as we then took out a great many series incandescent lamps which were perfectly satisfactory to our customers but which were, from a financial point, far from satisfactory to us.

Our experience shows the relation between the cost of furnishing electricity and of furnishing gas, to be this. The steam and labor required at the station to produce the electric current are cheaper than the coal and labor required to put an equivalent amount of gas into the holder, but in general the other expenses of manufacture and the cost of distribution, including all outside repairs under this head, are much greater in the case of electricity than in that of gas; and the expense of distributing electricity increases not according to the light supplied, but according to the possibility of supplying it to the various customers. It costs us about $14 direct, immediate outlay for each and every lamp that we put in. If a converter is fully loaded, somewhat less; but if it is but partially loaded, somewhat more. Our average is $14 exclusive of the lamp. If the wiring on private premises were not done at our expense, but at the expense of the customer, of course, the cost would be less to us, but would certainly not be less than $10 per individual lamp even in that case, and this does not include any allowance for the proportionate capital in the station and steam plant. To surely meet all charges for interest, depreciation and repairs, we assume that at least $2 per year must be allowed, therefore, it is our belief that if we cannot get enough in excess of $2 out of a lamp to more than meet our manufacturing expenses, it is not to our advantage to have that lamp on our line. We have, therefore, not endeavored to do any private house lighting by our electric department, simply because we do not see how that department could possibly make any money by it. Its income might be increased, but it would be at the expense of the capital account, which is already more than as large as we care to have it.

When a light is to be but little used we believe gas is preferable, both to the company and to the consumer, being more reliable as regards supply, and less liable to accident as regards the fixture. We have, therefore, practically drawn the line at fifty cents per month, and do not care to put in any lamps which would net us less than that. This charge is so high that we have very few lamps on our lines which are not in use at least part of every week day, and we feel that we are utilizing our outlay for lines and electric machinery to the fullest extent, while at the same time a certain class of consumer is relegated to the use of gas.

But our price for gas is such that our saloons and other places which are open late in the evening, generally found it too costly for them, and before the introduction of electricity were using kerosene. Now kerosene has been displaced and we are furnishing electric light at a profit to us, but at a cost to the consumer considerably below that which would be incurred if gas were used.

We actually make a discount to our consumers for the electric light used during that portion of the evening when the demand would otherwise be small. We are obliged to furnish the largest quantity of electricity at a certain time and almost all the expense of the incandescent plant would be incurred if the current were to be developed only during the short time referred to, therefore, at other hours we can afford to charge our customers less per lamp hour. This is a carrying out of the principle so familiar in the gas business of charging less for gas for day consumption. We charge less for electric light used during the time when the mains are not fully utilized, and in this way we are enabled to compete with kerosene.

We have no metered lights, nor under our present system of running do we care for any. Being in a small place, we are able to watch our customers fairly well and to know whether they are keeping to their contracts, and we are now under no obligation to have any lamps on our lines which do not bring in a regular income, whereas, if we used meters, we should almost be forced to put in lamps as our customers should wish, and the consequent charging per ampere hour would make electricity the direct competitor of gas, which we do not wish, and which we do not believe to be to the best interests of our customers or to the advantage of the company. For it is our opinion that we cannot have a lamp on our line which does not produce an income of at least $6 per year without its causing us a certain loss.

This we reckon about as follows: Fixed charges against each lamp amount in our case to about $2, which have to be more than covered before we can begin to earn a profit. If our profit in furnishing light amounts to 40 per cent., then our fixed charges would be met as soon as a lamp produced an income of $5; but we demand a further income of $1 to justify our risk in taking the lamp on to our line. These fixed charges we are forced to cover during the hours of heaviest lighting, and a study of our schedule will show that we succeed; but once they are covered we are able and willing to furnish light for longer hours at a very low price; for our business is conducted upon the principle and belief that electricity should be used for steady, continuous lighting, and gas in those places where artificial light is required but a portion of the time; for though we can furnish a given amount of light more cheaply by means of the incandescent lamp than by the use of gas, we require TIME in which to do it. Gas can be burned in such quantity and at such a time as our customers choose.

The *length of time* during which the electric light is to be used determines the economy of its supply and of its use.

Discussion.

The President—We have before us the question of how to successfully manage a combined gas and electric light plant, and many of us are interested in that subject. Perhaps Mr. Stiness will give us his opinion as to the position taken by Mr. Fowler.

Mr. Stiness—I feel a little hesitancy, at this late day, in speaking of electricity, after the greeting which the electric light men got this morning from the representative of that part of New England called Hartford, in the statement that it took a very bright man indeed to run gas works, but that any man could run an electric light plant. Having been engaged in that for so long a time, I have arrived at the conclusion that I do not know anything at all about electricity, and, therefore, perhaps the statement applies to myself. But the paper which Mr. Fowler has read follows in such close lines with my own experience, that if I were to write a paper on the same subject it would be almost identical with his. With our electric light plants (two electric light stations, equal to nearly 500 arc lights) and with a gas plant of about 70 millions output, we have followed on almost the identical lines which he has marked out. To one point of Mr. Fowler's I wish to refer. If I remember correctly, he said that he makes no special contracts. We have followed in that line ourselves. We have a price list which is put out to all. For us one man's money is as good as that of another. We have, as he has perhaps, different grades; but we furnish, and are compelled to furnish, a 20-candle lamp instead of a sixteen. It has been said by some one to-day that this should be called a "Light Association;" but I wish to say to those who suggest that, that the world moves. We are to-day receiving as members coal gas men, water gas men, and electric light men; but the future of the gas business is, in my judgment, as well assured as the future of the world—exactly. But the people must recollect, and these gentlemen who are concerned in or interested in the business must remember, that it makes no difference what we do; we have got to furnish what the public calls for, and if the public demands the electric light, that demand must be met. As I said one year ago, I looked forward with anticipations of hope that the future of artificial illumination will be far advanced at the end of the next decade of years from what it is to-day. By one speaker this morning it was said that there is a great deal of push in these electric light men. That is exactly what I admire in those gentlemen who have control of the electric lighting interest, not only in New England, but all over this country—they are men of push, they are men of energy; and, above all, there are men of scientific attainments standing behind them who rank with any men that the world can produce. I listened on Monday evening to a paper read by one of our Massachusetts Civil Service Commission, I think Mr. Lord. The electric lighting interests of Boston are taking gentlemen of that character, and are educating the public up to the benefits of electric lighting; and such a course will prove to be of great benefit to them. I will not go on any further in the elucidation of electric lighting; but it is a large field. You have to meet in active competition, unless you take it into your own household. I believe, as Mr. Fowler says, that the alternating system is not antagonistic to the gas company, but that they work together. For an intermittent service gas is decidedly the cheapest; but for a continuous service in the manner in which he speaks of, there are certain hours of the day when we can afford to give them that light at a much less rate, provided it will utilize the line. You know, Mr. President, and I know, that upon the first day of the week we are put to our trumps to find a place in which we may use the current which we must furnish to a few lights which we have on our circuit; and therefore we can go out and take in a seven day service on some lights, at a low rate, and yet make money. The

electric light business is a good paying business when properly managed. That is all that I have to say, except to add, after an experience in the consolidation and combination of gas and electric lighting, that it has not been done at the expense of the gas business. The latter pays us a fair remuneration, although not equal to the old substantial gas business.

The President—Mr. Coggshall has had a good deal of experience this last year in the electric light business, and probably he can give us his reasons for going into it.

Mr. Coggshall—My experience has been so limited that I am hardly prepared to give you facts such as I would like to give a body of men like this; but a year from now, if I live, I will tell you what has been the result of uniting the Fitchburg Gas and Electric Light Companies. The reason we went into it was that the old electric light company, having outgrown its plant, had to lay out a very large sum of money, and a combination of interests at that time seemed very desirable, and this was brought about one year ago. We have erected a new station, and have hardly got into it as yet. We have been running about one month. From our experience in that month we conclude that we are doing a very satisfactory business.

Mr. Holmes—I think that I am connected with the management of the smallest gas works (Winsted, Conn.) in New England, and perhaps the smallest electric light company. Our output of gas is less than two million feet per annum. We were making coal gas, and charging $3.50 per thousand. We are now making water gas and charging $2.50 per thousand, with a discount which gives it to the largest consumers at $2 per thousand. We are running 40 arc street lights, the equivalent of about 30 commercial lights, not arc lights, but large incandescent lights, two in place of one arc, and also about 500 incandescent lights, of which number something over 100 are in factories. We were organized in 1860 to make oil gas, but got a renewed charter in 1872 or 1873 to make coal gas, and a couple of years ago got an additional charter allowing us to distribute electricity. We have earned in years past as much as 3½ per cent. net in making coal gas; but since we have made water gas and electricity we have earned a good deal more than that. It has been hard work to increase the gas consumption. We have no gas stoves except two or three small stoves in saloons, but we are going to try that on this summer. We run our electric lights by water power. That is probably where we make a great gain, as we have a phenomenal water-power for the electric light business, although it is situated four miles from the centre of the town. We have a water power with a fall of 53 feet which runs a 21 inch wheel 390 revolutions per minute, and can get 260 horse power from it, but are now using only about 100 horse power. We charge 75 cents per month for 16 candle power incandescent lights, giving a discount of five per cent. We get $85 per year for our street lights, and are soon to reduce this price to $80, and take on 10 more lights. We get about the same price for our commercial arc lights. We are pushing the business a little, are making some money, and are tolerably happy.

Mr. Harbison—I think those who have been for a term of years engaged in the business of manufacturing and selling coal gas are being left in the background and forgotten.

The President—Let me remind the gentleman that the question before us is the management of small gas and electric light plants.

Mr. Harbison—The paper of Mr. Fowler has a statement with regard to the comparative cost of electric and gas lighting; and, if I remember correctly, he said that the electric light, for certain uses, or for certain hours of the day, was cheaper than gas. But bear in mind that his gas is $2.50 per thousand, and not $1.40. If he were making his comparison on the basis of $1.40 or $1.50 per thousand for gas, his conclusions might have been different. There is one further matter that I want to call special attention to. When my friend from Vermont read his paper this morning he stated, in speaking of the advantages of water gas over coal gas, that 14 years ago he was charging $3.50 for coal gas, but that ten years ago he put in a water gas plant, and reduced the price to $2.50. But let him bear in mind that a great many of us were furnishing coal gas 14 years ago and were charging $3.50 per thousand for it, just as he was, and that without putting in water gas plants we have been able to reduce the cost of coal gas to less than half the price we then charged. In fact, he would probably have been able by this time to sell coal gas for the same price he now sells water gas, if he had stuck to the coal gas business. While we may well consider the advisability of putting in a water gas plant as an auxiliary to a coal gas works, we should at the same time remember that in the last 14 years coal gas has made some considerable advance. We have not been at a standstill. I think that those engaged in the manufacture and distribution of coal gas can show as good results to-day as any water gas company in this country have been able to show. On motion of Mr. Harbison, a vote of thanks was passed to Mr. Fowler.

(A further discussion here followed with reference to the change of name of the Association, at the conclusion of which Mr. Lamson withdrew his motion. By direction of the President the motion and discussion are omitted.)

REPORT OF COMMITTEE ON NOMINATION OF OFFICERS.

Mr. Sherman, from the committee on the nominations of officers, presented the following report:

President—Charles F. Prichard, Lynn, Mass.

Vice-Presidents—Horace A. Allyn, Cambridge, Mass., and Wm. A. Wood, Boston, Mass.

Secretary and Treasurer—Chas. H. Nettleton, Birmingham, Conn.

Directors—Edward C. Jones, Henry B. Leach, Z. M. Jenks, Wm. Badger, and E. C. Learned.

On motion of Mr. Harbison, Mr. Sherman was instructed to cast the ballot of the Association for the election of the nominees of the committee.

The President—I declare that these nominees have been duly elected as officers of the Association for next year. Mr. Prichard will please come forward. (To the President-elect) These gentlemen, Mr. Prichard, have imposed upon you the highest honor which can be bestowed by this Association. It is an honor to be proud of, and in my judgment worthily bestowed; gentlemen, I introduce to you your President for the coming year.

Mr. Prichard—(President-elect)—Gentlemen, I can only say that I thank you most heartily for the honor you have done me, and I hope during the coming year that I shall be able to serve you to your satisfaction. But the President can do nothing without the hearty support and co-operation of the members. Let us unitedly endeavor to maintain and advance the interests of our Association.

The World's Fair Committee.

Mr. Harbison—At the last annual meeting of the American Association, held in Baltimore, in October last, the subject of a possible and probable World's Fair, to be held in 1892, was discussed, and a resolution was passed authorizing the council of the American Association to appoint a committee to represent that Association, to act in connection with committees appointed by kindred Associations, with special regard to an exhibit in connection with the gas industry to be made at that fair. It would be quite proper in my opinion, for this Association to take some action tending in the same direction. I therefore move that a committee of three be appointed by the chair to consider this question, and to report to the Association to-morrow the names of a committee to be appointed to represent this Association, and to act in connection with the committees of other Associations in respect to the World's Fair, whether it be held in 1892 or 1893.

The motion was agreed to, and the President appointed as such committee: Messrs. J. P. Harbison, H. A. Allyn and C. F. Spaulding.

Badges.

Mr. Stiness—I notice that our friend Harbison wears a decoration. The American Association of Gas Engineers have adopted a distinctive badge, and the Guild of Gas Managers have also a badge, but there is no distinctive badge for the New England Association. It has been suggested that a committee be appointed to prepare a suitable badge to be worn by the members of the New England Association at its yearly meetings, so that a member can recognize a brother almost as well in the dark as in the light. It is a very convenient form of recognition. I met gentlemen in the hotel to-day whom I have seen here and have heard speak, but had no idea that they were in the gas business. I make the motion that a committee be appointed to prepare a permanent badge for the New England Association.

Mr. Harbison—I would like to second that motion, and to add to it that the committee be authorized to procure a suitable badge for members of the Association at the expense of the Association, and to see to it that each member has a badge before the next annual meeting.

Mr. Stiness—There is another question which enters in and which perhaps the committee can be prepared to report about to-morrow, and that is the matter of the cost of the badges. The badges of the American Association cost $4 each, and I think a badge for this Association could perhaps be procured for a lesser sum—a different badge, say, for about $3.

The President—I understand the motion to go so far as to direct the appointment of a committee to select a badge and report here to-morrow. This motion was amended by Mr. Harbison, that the cost of the badges should be paid for out of the funds of the Association. After some discussion the amendment was withdrawn and the motion prevailed. The chair appointed as Committee on Badges: Messrs. S. G. Stiness, C. F. Prichard and J. A. Coffin.

Printing the Papers.

Mr. Lamson—I move that next year the papers which are to be read before the Association be printed and distributed among the members at the meeting.

The President—You have heard the motion of Mr. Lamson, that another year (as has been done in two instances this year) all our papers be printed before their presentation to the Association. (Adopted.)

News from the Absent Secretary.

The President—I have a telegram here from our Secretary which I should have noticed sooner, but was unable to do so:

"From Grand Island Depot, Nebraska. To Robert B. Taber, President of New England Association of Gas Engineers, Young's Hotel, Boston. Expected to be in Boston Tuesday, but was unavoidably detained. Best wishes for a successful meeting.

"Charles H. Nettleton."

The Association then adjourned to Thursday, February 20, 1890, at 9:30 A. M.

(To be Continued.)

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE following, from a correspondent, under date of Feb. 28, at Boston, is, to say the least, interesting:

To the Editor AMERICAN GAS LIGHT JOURNAL:—Here is a chance for you to invest, as per the following advertisement: "Dedham Electric Company, organized under Massachusetts laws. Full paid capital stock, $50,000. No bonded indebtedness. Subscription list for the stock, at $100 per share, now open. Investigation will show that this stock will net the investor, from January 1st, 1890, at least 6 per cent. per annum, free of taxes. Orders for indoor lighting solicited. For further particulars and subscription list apply to JOHN R. BULLARD, President." The Company started up January 18, 1890, but is already, you see, prepared to divide 6 per cent. among its stockholders, who have not yet taken up the stock. You may ask why it is necessary to *advertise* the stock; but that's because you don't know how many 6 per cent. stocks are to be had in New England. You know the Atchison Company paid 7 per cent. while the last 10 millions of their stock was being issued! Six per cent. isn't anything where such investments abound. Yours, truly, *

IT was remarked at the New England meeting last month that the electric lighting men were "pushing" individuals, and we fail to remember that that remark was controverted. And it goes without saying that the financial management of the Dedham Electric Company, as per their advertisement, are high in the class of "pushers." It requires a good deal of "push" nowadays to convince investors that any per cent. can be earned on the business of supplying electric lighting currents in small towns, and particularly so would this apply to a town of the size of Dedham, where a well-managed Gas Company already exists, also bearing in mind the fact that the projectors of the electrical enterprise feel that $50,000 will be required to start the project on a commercial basis. Either Dedham wants electric lighting at new hands very badly, or else Mr. Bullard and his confreres are gasconading. Another thing that appeals to us in this connecting is, if Bullard & Co. have such a bonanza, why do they not interview the proprietors of the Dedham and Hyde Park Gas Company with the object of winning the latter over. The Dedham gas men know a good thing when they see it; but they, on the other hand, are also conversant with the practice of separating fancy from fact. That is, perhaps, why they have been so successful.

IN our last issue brief mention (necessarily brief because of inability to obtain quickly the details of his life) was made of the death of Dr. H. H. Button, for many years President of the Milwaukee (Wis.) Gas Light Company. To the courtesy of a correspondent (whom we herewith thank for his kindness) we are enabled to give the following particulars respecting the career and work of Dr. Button: "Dr. Button died on Friday morning, Feb. 14th, from congestion of the brain. He was nearly 72 years of age, and had been very much affected by the death of his son-in-law, some three weeks since, who was a man in the very prime of life, full of vigor, possessed of unusual business ability, and who was warmly beloved by the Doctor. This relative had been ill only three days when death carried him off, and the shock to Dr. Button was most severe. Respecting the Doctor's connection with the Milwaukee Gas Light Company, I may say that he purchased his first stock in it in June, 1865, and was elected a Director the following month. After the death of Asael Finch (in March, 1883) the Doctor was elected President and continued to serve until death intervened. He was an excellent President, and took great interest in picking up the different points in gas manufacture, and educating himself in the new ideas advanced from time to time. Although very conservative in his ideas and ways, he was nevertheless anxious to keep up with the times, and to adopt all new methods that tended to cheapen the cost of gas, or to better its quality. He could not be excelled as a financier, and his personal integrity could not be questioned. He was in the very highest sense that the words imply, honest, kind and just. He was the leading advocate of the policy of reducing the price of gas in Milwaukee, and did much for the consumer in being so thoroughly persistent in his efforts in this direction. While it benefited the consumer at the same time, as you well know, it has been the means of putting this Company in the sound financial condition that it is. He will be greatly missed by his friends, and all those who had business connection with him. Mr. John L. Mitchell, now Vice-President, will doubtless succeed him. He is one of our largest capitalists, and will, I believe, be a splendid man in the place. His father (now dead) was Alex. Mitchell, for so many years President of the Chicago, Milwaukee and St. Paul Railroad. Yours, etc., E. G. C."

IT is reported that the proprietors of six large iron smelting or working furnaces in the vicinity of Pittsburg, Pa., are figuring on the possibility of substituting an artificial gas for the natural article. Among the six is mentioned the name of the Pennsylvania Tube Works Company.

A FEW days ago, Captain Supplee, in the second branch of the local government of Baltimore, Md., offered the following resolutions, which were referred to the Legislative Committee:

"*Resolved by the Mayor and City Council of Baltimore*, That the Legislative Committee be and is hereby instructed to present to the General Assembly of Maryland the following amendments to the measure now pending for the regulation of the contract for gas supply of Baltimore:

"*First.*—The Consolidated Gas Company shall have the exclusive right to manufacture and supply illuminating and fuel gas for 10 years in the city of Baltimore.

"*Second.*—The price charged the city for illuminating gas shall not exceed $1.10 per 1,000 feet; the price charged private consumers shall not exceed $1.25 per 1,000 feet.

"*Third.*—Whenever the dividends declared by the Company, after setting aside 1 per cent. as a sinking fund to extinguish its bonded debt, shall exceed 5 per cent. annually, the price of gas shall be reduced 5 cents per 1,000 to both the city and private consumers for each one-half per cent. dividend declared above 5 per cent.; that is to say, whenever the dividend declared shall be 5½ per cent. the price of gas shall be $1.05 and $1.20, respectively; when 6 per cent. shall be declared, the price charged shall be $1 and $1.15, respectively, etc."

AMONG the notable examples of bold engineering developed in the construction of the great sugar refinery of Claus Spreckels, at Philadelphia, Pa., one of the most unique is the hanging or aerial steam engine foundations. The engines used in this huge establishment are distributed practically all over the buildings, a large proportion of them being on the upper floors. Some of these engines are bolted to iron beams or girders on the second and third stories of the buildings, and are therefore innocent of all foundation. Some of these engines ran noiselessly and satisfactorily, while others produced more or less rattle and vibration. To correct the latter, the engineers simply suspended foundations from the bottoms of the engines, so that, in looking at them from the lower floors, they were literally hanging in the air. From this it would seem that the foundation to an engine does service merely from its weight alone. Hence it makes small difference whether the support be firmly imbedded in mother earth or in the air.

R. S. BLODGET, Chief of Police, Saratoga, N. Y., has adopted the following method of putting an end to stray dogs: A large box, with glass top and sides—the top being removable—is fitted with an ordinary ½-inch service pipe, leading from the riser that serves gas in the station. The doomed animals are placed in the box, the gas is turned on, and the end is accomplished. The first victim was a dog weighing 45 lbs.; the quantity of gas admitted was 8 cubic feet, and at the end of an exposure of a period of 2 minutes and 12 seconds the brute succumbed.

PRESIDENT MCMILLIN, of the Laclede Gas Company, is responsible for the following: Some time ago (the month was December) a company announced its readiness to supply natural gas in Columbus, O. The proprietors had rented a large room for an office. Over a desk in a dark corner they placed a 2-burner fixture to use the ordinary manufactured article of gas, being more convenient for illuminating purposes than their own product. Around the room they placed various sample stoves, grates, etc., for burning natural gas to show the citizens how the thing worked. These were connected by various service pipes with their own main in the street, and were kept going all day. When New Year's came they had a big bill from the Columbus Gas Company. It was paid under protest. When February came around the size of that gas bill was something marvellous. It was such a veritable behemoth of a bill that the recipients got up and howled with all their might, ending with a peremptory demand that the offending meter be taken out instanter, or before it plunged them into hopeless bankruptcy. A mild-mannered gas employee came around promptly February 2d and read the meter preparatory to taking it away for good. It had been read Jan. 30, and in the three intervening days had recorded 3,000 cubic feet with only two burners going and its hands tied behind its back. The mild-mannered man was astounded. He hurried the meter away and tested it, feeling sure that something was radically wrong. But the meter refused to yield up its integrity. It came out of the test a meter to be proud of. It was all right. Then the mild-mannered man sat down be-

fore it and for a long time wrapped himself in thought as with a blanket. Finally a horrible thought struck him. He put on his hat and started for the office of the natural gas company. Half way there he met the chief clerk—the man who but an hour before had been the chief swearer in the matter—now meek as a lamb, coming to insist that the meter should be replaced at once, and only too anxious to "pay that outrageous gas bill." He tried hard to keep from explaining, but the mild-mannered man was suspicious and persistent, and it had to come out at last. In tapping the pipes for the various sample stoves and grates a mistake had been made in one connection, and the pipe of the illuminating gas company had been tapped. For six weeks the natural gas people had been using about 25 feet an hour of manufactured gas, and selling natural gas by samples of the artificial article. Of course, the meter went merrily round and the bill went up. The natural gas people wanted the matter kept quiet, but this is so far from home that it won't count.

AT a meeting of the Directors of the Jacksonville (Ills.) Gas Light and Coke Company Mr. M. P. Ayres was elected President, and F. M. Doan was chosen Secretary and Superintendent.

AT a recent meeting of the Committee of Manufactures (Massachusetts Legislature) the matter under consideration was the taking of testimony in respect to the petition of the Amesbury and Salisbury Gas Company for the repeal of the State law (chap. 428, Acts of 1888) limiting the carbonic oxide content in illuminating gas to 10 per cent. One of the testifiers was Mr. C. W. Hinman, State Gas Inspector, who in his remarks went into the subject of water gas in a general way, and detailed the circumstances of the passing of the legislation of some years since in regard to water gas. He said he was largely responsible, perhaps, for the institution of the carbonic oxide limitation. His views, however, had been to a certain extent modified by subsequent experience, and if he had the same work to do over again he should do differently. He had known nothing of the commercial question involved in the oxide clause. Then he regarded it as a matter of little importance, and even the companies themselves made little objection to it. In rich water gas he testified there was no necessity for any oxide limitation, and that in 20-candle water gas 15 per cent. of carbonic oxide was not dangerous.

MESSRS. COFFIN & STANTON, of this city, as representatives of certain capitalists, have purchased for cash the property and franchises of the Crawfordsville (Ind.) Gas and Electric Light Company. We understand that Mr. P. C. Somerville will remain, for the present at least, Manager of the Company. He ought to be induced to remain there permanently.

A CONTROLLING interest in the Media (Pa.) Gas Company has been purchased by Mr. Francis M. Brooke. The cause which impelled him to become the heaviest shareholder in the concern is a queer one. Not long since he purchased at foreclosure sale a plot of ground close to the works, and subsequently acquired another piece in close proximity. The Gas Company's holder stands between the plots, and as Mr. Brooke is desirous of improving the property, he determined to secure control of the gas works, and thus be in position to order the relocation of the offending gasholder.

THE Mattoon (Ills.) Electric Light Company has turned on its current, and begins business with 36 arc lights in circuit.

THE Munn interest in the Freeport (Ills.) Gas Company has been purchased by Mr. L. F. Farwell, which gives to the latter complete control of gas and electric lighting supply of the town.

THE proprietors of the Atlantic City (N. J.) Gas and Water Company have arranged to put in a 16-inch main, from the works, down Michigan avenue to Atlantic, and a 12-inch from Atlantic to Pacific avenues.

THE proprietors of the Greenville (O.) Gas Company have agreed, until further notice, to sell gas at uniform rate of $1 per 1,000 cu. ft.

ON February 22d, the buildings in which were housed the electric lighting apparatus of the Freeport (Ills.) Gas Light and Coke Company, were destroyed by fire. The loss is returned at $25,000, and the insurance carried was only $3,000. The disparity between the amounts mentioned is accounted for on the ground that the insurance rates on risks of this class are very high; further, that insurance companies are by no means anxious to assume such risks. In the Freeport instance the boiler house was a frame structure, and it was in that building that the fire originated. This unfortunate occurrence caused much annoyance to the residents, as the Company has the contract for carrying on the public lighting, which is on the arc plan, but as Superintendent Runner was authorized by Mr. Farwell to rent power for the operation of an emergency dynamo, the interruption to the street lighting was of but short duration. The station will be rebuilt at once, with brick power buildings, however.

A GAS COMPANY for Vinton and Roanoke, Va., has been organized, and its bill for incorporation has been passed by the Legislature.

IT is now a certainty that the property and franchises of the Indianapolis Gas Light and Coke Company, the Indianapolis Citizens Gas Light Company, and the Indianapolis Natural Gas Company, have passed under the control of the Equitable syndicate of this city. The following circular will prove of interest in this connection:

"OFFICE OF THE EQUITABLE GAS LT. CO., OF NEW YORK,
340 THIRD AVE., NEW YORK, Feb. 21, 1890.

"I beg to call your attention to the fact that a syndicate; composed of some of the largest stockholders in this Company, has just completed the purchase of the gas business (lighting and fuel) of Indianapolis, consisting of various natural gas and fuel, illuminating gas, and electric light companies now in existence there, and has organized thereon the Indianapolis Gas Company, and now offers at private subscription a certain portion of the bonds of the new company. These bonds are 30-year gold 6 per cent. bonds, coupons payable April and October, and are offered at par with a bonus of 25 per cent. of stock. This stock will have an immediate and large dividend paying capacity, as the business is already established and is increasing rapidly and steadily. Payments on subscriptions will be through the Central Trust Company, of New York, by installments of 25 per cent., commencing March 15 and ending June 2. In case you want to participate in this enterprise, which will be one of the most successful in its line ever carried on in this country, please let us know at once; and, if you wish further particulars as to the present earnings of the business and its prospects in the future, I shall be glad to furnish them to you if you will call at this office. Very respectfully yours, —. —. —."

WHILE no doubt the amalgamated lighting interests of Indianapolis will constitute a much more imposing enterprise than did the Indianapolis Gas Light and Coke Company, when taken singly—although we have an idea that that arm of the new confederacy is the member that shall convey the greatest force to the confederacy—we are nevertheless sorry that its destiny is to be destroyed—if not destroyed, at least cloaked. The history of the old company is that of fair-dealing, which clothed it with power that was never abused. And much of that history can be traced to the master hand of one known to his fellows as the "Sage of Indianapolis"—James Somerville.

WHEN General Manager Ellison, of the St. Paul Gas Company applied to the Building Department of the city for a permit to restore the structure recently damaged by explosion, he was astonished to find that a protest against the reconstruction had been lodged by several property holders in the vicinity of the works. The objection was based on the ground that the works were a menace to life and property; also that their operation tended to reduce the value of the surrounding holdings. The permit, however, we are informed was granted, the inspector alleging, and very properly, "that the gas plant was built many years before most of the residences were constructed, and that the Company has rights and privileges that cannot consistently be overlooked."

AT a recent meeting of the Fredericksburg (Va.) City Council Mr. McCracken presented a resolution (which was adopted) containing an act for the construction and operation of a gas works on municipal account. The act is now before the Legislature.

WE understand that the City Council of St. Joseph (Mo.) has agreed to the proposition for a charter for an opposition gas company, under the pledges submitted by F. F. McGuire and his backers. The leading points in the ordinance are: The City Engineer is to have supervision over all street excavations and the subsequent repaving. Any injury resulting to persons or property, by reason of the construction of the works, to be settled for by the Company. The Company shall have on the ground, by August 1, 1890, three miles of pipe for distributing gas, one mile of which shall be laid, and shall also have begun the construction of its plant, and shall within 18 months after the acceptance of the franchise be prepared to furnish gas along at least 10 miles of pipe. The Company shall deposit $20,000 cash with the Comptroller as a guarantee of good faith, 60 days from the acceptance of the franchise, the money to remain on deposit until the Company shall have given satisfactory evidence of having invested $150,000 in the plant, a bond of $20,000 to

be deposited at the same time. The maximum price of gas to be 75 cents per 1,000 cubic feet for fuel purposes, and $1 per 1,000 for illuminating use. The city hall, engine houses and calaboose are to be lighted free of charge. The ordinance is to be accepted within 20 days after its passage. If the Company ever consolidates with any other Company the price of gas is not to exceed that named in the ordinance. The gas is to be odorized. This ordinance may give trouble to the authorities of St. Joseph in the near future.

OWING to the unprecedented rise in the Kentucky river, gas was shut off from Frankfort on the evening of March 1st.

THE Van Buren (Ark.) Investment Company has been incorporated by Messrs. W. H. H. Shibley, Geo. R. Wood, J. N. Brown, W. H. Ross and W. P. Brown. It is capitalized in $50,000. One of the purposes of its formation is to construct and operate a gas and electric light works. This place is the capital of Crawford county, Ark., and is on the north bank of the Arkansas river, at a point about 9 miles northeast of Fort Smith. Population, about 4,000.

PRESIDENT ALLSTATTER, of the Board of Trustees of the Hamilton (O.) municipal gas works, is of the opinion that the works will be in operation on or before April 22d.

THE Philadelphia *Record* of March 3d contains the following: "The purifying house of the large gas works connected with the saw works of Henry Diston & Sons, at Tacony, Pa., blew up shortly after 8 o'clock yesterday morning. The building in which the explosion took place was constructed of brick, 1 story high, and located some distance from the other buildings. It was completely wrecked, together with the machinery. All the gas used in the blast furnaces and for lighting the works and the streets and residences of Tacony was purified in the destroyed building. The watchman noticed something wrong at an early hour in the morning, and started off to find one of the engineers. Before the latter arrived the explosion occurred. The loss to the buildings and machinery will not be great, but the loss to the works will be considerable, owing to the loss of time before new machinery can be procured and set up. In the meantime Tacony will be without gas."

THE Fairfield (Iowa) Gas and Electric Company, with a capital stock of $50,000, has been incorporated.

IN the reorganization of the Monroe (Mich.) Gas Light Company the capital has been put at $40,000.

THE Columbus (O.) Gas Company is experimenting, on a practical working scale, with the Gordon regenerative street lamp as an agent for street lighting.

IN response to the invitation of the Troy (N.Y.) authorities to tender for public lighting, the Troy Gas Company proposed the following: Not less than 280 arcs (1,200-candle power), 38 cents per light per night; 2,000-candle power, 42 cents per light. If a 3-year contract be allowed, the respective prices to be 37 cents and 41 cents; if for 5 years, the rates to be 37 cents and 39½ cents, respectively. Under the gas lighting head of the specifications, the Troy Gas Company offered the following: 310 Gordon lamps and 625 boulevard lamps (ordinary pattern), to be maintained under the schedule, at $39,420 for 1 year's service; 370 Gordon lamps and 625 boulevard lamps, $44,238; 450 Gordons and 620 boulevard pattern, $49,056; 625 ordinary street lamps, 8½ cents per night each. Gas to public buildings, $1.50 per 1,000. It would perhaps be a surprising thing were Troy the first city in this country to adopt a sensible plan of lighting streets by gas—that is, in respect to a new, but eminently satisfactory system.

MR. GEO. D. CURTIS, well known to the fraternity of Central New York, from his connection with the Albion Gas Company, has removed to Atlanta, Ga.

THE ordinance regulating the price of gas in St. Louis, which was vetoed by Mayor Noonan, has been passed over the veto by the Municipal Assembly. The vote was 9 to 3.

CAPT. D. H. HENSLEY, Secretary of the Hamilton (O.) Gas Light Company, has been appointed local postmaster.

MESSSS. T. F. OAKES, Crawford Livingston and General H. H. Sibley have been elected Directors in the St. Paul Gas Light Company. The first named is supposed to represent the recently-acquired interest in the Company secured by Mr. Henry Villard.

THE Rockford (Ills.) Gas Company has been purchased by the American Gas Company, of Philadelphia.

THE Poughkeepsie (N. Y.) Gas Light Company has brought suit against Wm. O'Riley for $52.50, which sum the plaintiff claims is due because of defendant's negligence in the construction of a sewer through Main street. On account of faulty shoring the Gas Company's main was fractured, thus causing a loss of 45,000 cubic feet of gas. The defense interposed is a general denial, coupled with the statement that, as the work was being done on city account, O'Riley is not the real defendant.

Coke Brick for Furnace Linings.

The *Iron Age* says that at the last meeting of the German Society of Iron and Steel Metallurgists, F. Burgers, of Gelsenkirchen, presented a short statement of his experience with a special brick used to line the bosh and hearth of blast furnaces. It is a matter of frequent occurrence that linings 3 to 4 feet thick are soon reduced to a few inches. Then streams of water must be used to keep the walls from being destroyed. The chief reason for this rapid destruction of the refractory material is the fact that the cinder dissolves it, fluctuating in its composition, as it does frequently, from an acid to a basic cinder. Experiments made showed that the best refractory firebrick, varying in composition, were destroyed in one or two hours when placed in the cinder run. This circumstance led Burgers to seek for another material. His attention was directed to coke. The first experiment, begun in 1882, was directed to binding with clay, coal, coke, and graphite, and using the mixture in a form of brick. Dr. Otto & Co., a leading firm of German manufacturers of firebrick, furnished a series of samples which, however, were defective in this point—that in binding the brick the carbon had been partly removed; but even this sample gave good results.

In 1885 Pourcel, in describing the manufacture of ferromanganese, at Terrenoire, stated that the hearth and bottom of the furnace were made of graphite brick. He used as a raw material retort graphite containing 1 to 2 per cent. of ash, ground it, mixed it with tar, formed it into brick, and then heated it. A part of the tar cokes and binds the graphite to a solid brick. Burgers had experiments made with ground coke, low in ash, instead of graphite, obtaining good results.

In 1885 No. 2 furnace of the company with which Mr. Burgers is connected was lined with this coke brick, with excellent results. They have been introduced also with the Rheinische Steel Works, and at Rombach. At Mechernich the same material has been used for lining lead furnaces. During the course of a brief debate upon the subject, Burgers stated that the cost of the brick is about 100 marks per ton.

Recent Patent Issues.

The following list of recent patents relating to the gas interests is specially reported by Franklin H. Hough, solicitor of American and foreign patents, 925 F street, N. W., Washington, D. C.

ISSUE OF FEBRUARY 4, 1890.

420,726. Gas Regulator. C. P. Kolm, Knapps Creek, N. Y.
420,751. Gas Washer. W. T. Walker, Bishopswood Road, Highgate, England.

ISSUE OF FEBRUARY 11, 1890.

421,217. Gas Burners, Heating Attachment for. J. A. Wilson, Baltimore, Md.
421,263. Gas Furnace for Melting Metals. H. H. Garrett, Pittsburgh, Pa.

ISSUE OF FEBRUARY 18, 1890.

421,606. Gas Burner. A. G. Morey, LaGrange, Ills.
421,473. Gas Engine. H. J. Baker, Chicago, Ills.
421,474—421,475 and 421,477. Gas Engines. J. C. Beckfeld and A. Schmid, Allegheny, Pa.

ISSUE OF FEBRUARY 25, 1890.

421,924. Gas Burner. T. Gordon, Philadelphia, Pa.
422,299. Gas and Air Mixer. J. W. Danforth and R. W. Clark, Buffalo, N. Y.
422,173. Gas Washer. F. A. M. Alavoine, Beauvais, France.

WE understand that the bill regulating the gas supply of Baltimore, Md., has passed the lower branch of the State Legislature, the vote being decisively in its favor. The only substantial amendment to the bill is that which reduces the time (for which the grant to the Consolidated Company is to be exclusive) to 15 years from 25. Well informed people give it as their belief that the Senate will indorse the bill.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS,

EDITOR—Jos. R. Thomas, C.E.
ASST. EDITOR—T. J. Cunningham.
MANAGER—C. E. Sanderson.

PUBLISHED ON EACH MONDAY OF THE YEAR AT

No. 42 Pine Street, New York.

This is a recognized official organ of
LIGHT, HEAT, STEAM, WATER SUPPLY,
VENTILATION, SANITARY IMPROVEMENT,
AND GENERAL SCIENCE

TERMS:

SUBSCRIPTION—Three Dollars per annum, in advance. Single copies, 10 cents.

AGENTS.

NEW YORK.—AMERICAN NEWS CO., 39 and 41 Chambers Street.
PHILADELPHIA.—PRATT & CO., Corner Ninth and Arch Streets.
Germany.—B. WESTERMANN & CO., of New York.

MONDAY, MARCH 10, 1890.

The Market for Gas Securities.

The city market for gas shares shows no marked change in quotations over those reported for last week. In general the tone is weaker, although this is to be attributed more to lack of inquiry for securities than to any real cause concerning either the management or business of the properties affected. Brooklyn shares are steady to strong, with but little stock offering. Baltimore gas keeps fairly steady, and the probability is that still higher figures in it will shortly be recorded. The measure introduced into the House giving to the Company the exclusive right to manufacture gas in Baltimore for a term of years, in consideration of certain moneys annually paid to the city treasury, has passed that branch of the Legislature, and this seems to us to be equivalent to its final enactment, for it is more than rumor that the Senate will interpose no objection. The Governor also favors the measure, if certain unofficial utterances of his about it are to be accepted as indicative of his leanings. President Morris, of the Louisville Company, has officially announced that to-day that Company will be ready to furnish a non-illuminating fuel gas, at the rate of 50 cents per 1,000. This experiment will be watched with interest, and Mr. Barret will come in for no small share of congratulation should his studies in this direction lead to success.

It is more than likely that the Troy (N. Y.) Gas Company will absorb the Troy Electric Light Company's plant. In any event the city's public lighting has been awarded the Gas Company, and as the contract calls for both gas and electric lighting, the contractors might do worse than absorb their competitor, a competitor, however, that was never over strong. Mr. Thomas Turner has been re-elected President of the Charleston (S. C.) Gas Light Company, and the Directors are: Messrs. A. S. Johnson, W. B. Smith, John S. Riggs, Geo. W. Williams, Morris Israel, H. E. Young, G. L. Buist and John C. Simonds.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

MARCH 10.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	95½	96
Central	500,000	50	—	—
" Scrip	220,000	—	—	—
Equitable	4,000,000	100	119	122
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	116	118
Mutual	3,500,000	100	110	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	45	—
Preferred	5,000,000	100	87	90
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	109	111
Citizens	1,200,000	20	68	70
" S. F. Bonds	320,000	1000	100	103
Fulton Municipal	3,000,000	100	121	124
" Bonds	300,000		100	105
Peoples	1,000,000	10	80	82
" Bonds (5's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	93	96
Nassau	1,000,000	25	115	—
" Ctfs	700,000	1000	120	122
Williamsburgh	1,000,000	50	120	123
" Bonds	1,000,000	—	108	112
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	93	93½
2d " " "	3,000,000	1000	71	72
Bay State Gas Co.—				
Stock	5,000,000	50	24	25
Income Bonds	2,000,000	1000	—	--
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds	45,000	—	--	—
Chicago Gas Trust	25,000,000	100	44½	—
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	—	93½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	97	—
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	99
2d "	2,500,000	1000	96	100
Consumers Gas Light Co., Jersey City	2,000,000	100	15	25
Bonds	600,000	1000	80	—
Cincinnati G. & C. Co.	6,000,000	100	201	203
Consumers Toronto	1,000,000	50	190	200
Central, S. F., Cal.			80	90
Capital, Sacramento, Cal			58	
Consolidated, Balt.	11,000,000	100	54	54½
" Bonds	6,400,000		107	107½
Hartford, Conn	750,000	25	102	108
Jersey City	750,000	20	186	190
Laclede Gas Light Co., St. Louis, Mo.—				
Common Stock	7,500,000	100	14½	15½
Preferred "	2,500,000	100	—	—
Bonds	9,034,400	1000	84½	—
Louisville, Ky	2,570,000	50	125	130
Little Falls, N. Y.	50,000	100	—	100
" Bonds	25,000	—	100	103
Montreal, Canada	2,000,000	100	200	208
Memphis (Tenn.) Gas	750,000	100	48	51
" Bonds	240,000	100	103	—
New Haven, Conn		25	200	—
Oakland, Cal			35	35½
Peoples, Jersey City		—	60	61
" " Bonds			—	—
Paterson, N. J		25	99	102
Rochester, N. Y		50	99	100
Syracuse, N. Y	500,000	25	—	—
San Francisco Gas Co. San Francisco, Cal	10,000,000	100	55½	55¾
Washington, D. C	2,000,000	20	200	208
Wilmington, Del.		50	88	90

Advertisers Index.

GAS ENGINEERS. Page

Jos. R. Thomas, New York City ... 344
Wm. Henry White, New York City ... 347
Wm. Mooney, New York City ... 344
William Gardner, Pittsburgh, Pa ... 344
Fred. Bredel, N. Y. City ... 343

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City ... 347
Continental Iron Works, Greenpoint, L. I ... 347
Delly & Fowler, Phila., Pa ... 347
Kerr Murray Mfg. Co., Fort Wayne, Ind ... 335
Stacey Mfg. Co., Cincinnati, Ohio ... 347
Bartlett, Hayward & Co., Baltimore, Md ... 345
Morris, Tasker & Co., Limited, Phila., Pa ... 345
Davis & Farnum Mfg. Co., Waltham, Mass ... 295
R. D. Wood & Co., Phila., Pa ... 346
Bouton Foundry Co., Chicago, Ills ... 347
Smith & Sayre Manufacturing Co., New York City ... 346
Fred. Bredel, N. Y. City ... 343
United Gas Improvement Co., Phila., Pa ... 337
National Gas Light and Fuel Co., Chicago, Ills ... 338
Simpkin & Hillyer, Richmond, Va ... 332

GAS AND WATER PIPES.

Gloucester Iron Works, Phila., Pa ... 344
Mellert Foundry and Machine Co., Reading, Pa. (John Fox, Selling Agent, N. Y.) ... 344
Ohio Pipe Co., Columbus, Ohio ... 344
M. J. Drummond, New York City ... 344
R. D. Wood & Co., Phila., Pa ... 346
Warren Foundry & Machine Co., New York City ... 344
Donaldson Iron Co., Emaus, Pa ... 344
Dennis Long & Company, Louisville, Ky ... 344

PROCESSES.

National Gas Light and Fuel Co., Chicago, Ills ... 338
Bartlett, Hayward & Co., Baltimore, Md ... 345
Wm. Henry White, N. Y. City ... 347
United Gas Improvement Co., Phila., Pa ... 337

INCLINED RETORTS.

Laclede Fire Brick Manuf'g Co., St. Louis, Mo ... 335

GASHOLDER TANKS.

W. C. Whyte, New York City ... 338
J. P. Whittier, Brooklyn, N. Y ... 339

GASHOLDER PAINT.

The Government Waterproof Paint Co., Boston, Mass ... 332

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J ... 342
B. Kreischer & Sons, New York City ... 342
Adam Weber, New York City ... 342
Laclede Fire Brick Manuf'g Co., St. Louis, Mo ... 342
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y ... 342
Borgner & O'Brien, Phila., Pa ... 342
James Gardner, Jr., Pittsburgh, Pa ... 342
Henry Maurer & Son, New York city ... 343
Chicago Retort and Fire Brick Co., Chicago, Ills ... 342
Baltimore Retort and Fire Brick Co., Baltimore ... 342
Oakhill Gas Retort and Fire Brick Co., St. Louis, Mo ... 342

SCRUBBERS AND CONDENSERS.

G. Shepard Page, New York City ... 336
R. D. Wood & Co., Phila., Pa ... 346

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md ... 345
Fred. Bredel, New York City ... 343
Chicago Retort and Firebrick Co., Chicago, Ills ... 342
Wm. Henry White, N. Y. City ... 347
J. H. Gautier & Co., Jersey City, N. J ... 342

GAS GOVERNORS.

Connelly & Co., New York City 339
Fred. Bredel, N. Y. City 343
Friedrich Lux, London, England 331

SELF-SEALING MOUTHPIECE DOORS.

Smith & Sayre Mfg. Co., New York City 346

TAR AND CARBONIC ACID EXTRACTOR.

Geo. Shepard Page, N. Y. City 296

CEMENTS.

C. L. Gerould & Co., Brooklyn, N. Y 342

GAS ENRICHERS.

Standard Oil Co., Cleveland, Ohio 348

GAS METERS.

John J. Griffin & Co., Phila., Pa 350
American Meter Co., New York and Philadelphia 351
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa ... 351
Helme & McIlhenny, Phila., Pa 351
D. McDonald & Co. Albany, N. Y 351
Nathaniel Tufts, Boston, Mass 350
Maryland Meter and Manufacturing Co., Baltimore, Md ... 350
Bell & Jones, Philadelphia, Pa 350

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind 334
Smith & Sayre Manufacturing Co., New York City 346
Wilbraham Bros., Philadelphia, Pa 339
Connelly & Co., New York City 339

GAS COALS.

Penn Gas Coal Co., Phila., Pa 349
Perkins & Co., New York City 348
Newburgh Orrel Coal Co., Baltimore Md 349
Despard Coal Co., Baltimore, Md 349
Chesapeake and Ohio R. R. Coal Agency, N. Y. City 349
Westmoreland Coal Company, Phila., Pa 349
J. & W. Wood, New York City 348

CANNEL COALS.

Perkins & Co., New York City 348
J. & W. Wood, New York City 348

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y 340
John McLean, New York City 340
Chapman Valve Manufacturing Co., Boston, Mass 340
R. D. Wood & Co., Phila., Pa 316
The P. H. & F. M. Roots Co., Connersville, Ind 334

GAS ENGINES.

Schleicher, Schumm & Co., Phila., Pa 352
Clerk Gas Engine Co., Phila., Pa 340
Van Duzen Gas Engine Co., Cincinnati, Ohio 340

ENGINES AND BOILERS.

Jarvis Engineering Co., Boston, Mass 339
Ball Engine Co., Erie, Pa 332
Westinghouse Machine Co., Pittsburgh, Pa 343

GAS LAMPS.

G. Shepard Page, New York City 300
Welsbach Incandescent Gas Light Co., Phila., Pa 333
The Siemens-Lungren Company, Philadelphia, Pa 333

PURIFIER SCREENS.

John Cabot, New York City 340
Bartlett, Hayward & Co., Baltimore, Md 340

GAS STOVES.

American Meter Co., New York and Philadelphia 341
The Goodwin Gas Stove and Meter Co., Phila. Pa 312
George M. Clark & Company, Chicago, Ills 333
D. McDonald & Co., Albany, N. Y 351
Maryland Meter and Manufacturing Co., Baltimore, Md 310
Bell & Jones, Philadelphia, Pa 350
Chicago Gas Stove Company, Chicago, Ills 332

STREET LAMPS.

J. G. Miner, Morrisania, New York City 332
Bartlett Street Lamp Man'fg Co., New York City 332

BURNERS.

C. A. Gefrorer, Phila., Pa 348

STEAM BLOWER FOR BURNING BREESE.

H. E. Parson, New York City 340

PURIFYING MATERIAL.

Connelly & Co., New York City 339
Friedrich Lux, London, England 331
Edgewater Lime Works, Edgewater, N. J 332

COKE CRUSHER.

C. M. Keller, Columbus, Ind 349

ELECTRICAL APPARATUS.

Wm. Henry White, N. Y. City 347

SOLVENTS.

Maas & Waldstein, New York City 339

BOOKS, ETC.

Gerould's System Gas Bookkeeping 331
1889. Directory. 1889 342
King's Treatise 344
Scientific Books 350
Management of Small Gas Works 340
Gas vs. Electricity 332
Practical Electric Lighting 339
Electric Light Primer 339
American Gas Engineer and Superintendents' Handbook ... 349
Digest of Gas Law 332
Fuel and its Applications 331
Newbigging's Handbook 343

WANTED,

A young man to act as

Meter Taker and to Make Himself Useful

in a small Gas Works. Must understand gasfitting and be strictly temperate. Address, with references,

768-2 "G.," care this Journal.

POSITION WANTED

As Manager of a Gas Works

Making from 5 to 10 million cubic feet per annum. Six years' experience. Address "J. M. M.,"

767-4 Care this Journal.

POSITION WANTED.

A Mechanical Engineer,

Experienced in Gas Manufacture, wishes a position as Superintendent of a Gas Works. Best of references given and asked. Salary, $1,200.

"MECHANICAL ENGINEER," care this Journal,

765-tf or Box 972, West Bay City, Mich

Position Wanted

As Superintendent or Assistant of a Gas Works,

By a man who can give the best of references. Thoroughly understands the manufacture and distribution of gas and the construction of works. Address

770-3 "M.," care this Journal.

FOR SALE,

The Ironwork for 11 Benches of 5's, viz.:

Cast Iron Hydraulic Mains, 17 inch diameter, inside.

Dip Pipes, Bridge Pipes, Stand Pipes.

Mouthpieces and Lids.

Four Purifiers, 10 by 16 ft., with 10-inch Connections and dry Center Seal.

Four Purifiers, 5½ by 10 ft., with 6-inch Connections and Wet Center Seal.

Valves, 6-inch, 8-inch, and 10-inch.

DAVID MOORE, Treas. Salem Gas Lt. Co.,

770-tf Salem, Mass.

FOR SALE.

We offer the following gas apparatus for sale, delivered f.o.b. cars Fort Worth, Texas:

Two Benches of 3's, with cast iron Hydraulic Main, Dip and Ascension Pipes, and Mouthpieces (14 by 23 in.).

One Bench of 6's, with cast iron Hydraulic Main, Dip and Ascension Pipes, and Mouthpseces (12 by 20 in.)

Two Benches of 3's, with cast iron Hydraulic Main, Dip and Ascension Pipes, and Mouthpieces (14 by 24 in.).

Four Purifiers, 6 ft by 6 ft., with 6-in. Connections and Center Seal. **Steam Jet Exhauster. One Set Pipe Condensers** (6-in.). **One Upright Scrubber,** 11 ft. high by 36 in. diam., with Bye-Pass. **One Station Meter,** daily capacity 100,000 cu. ft. **One Upright Boiler,** 20 horse power.

All of above apparatus in first-class condition and are so guaranteed. For further particulars address

FORT WORTH LT. AND POWER CO.,

767-4 Fort Worth, Texas.

GAS WORKS FOR SALE.

A CONTROLLING INTEREST IN SEVERAL

Interior California Coal Gas Plants,

now paying handsomely, are offered on very reasonable terms. This is an exceptionally good opportunity for practical gas men of limited means, wishing to remove to a mild and healthful climate, to acquire an established and paying business. Particulars given and full investigation solicited.

SECRETARY, 123 Beale Street,

760-3 mos. San Francisco, Cal.

FOR SALE.

A Complete Water Gas Plant.

60,000 Cu. Ft. Daily Capacity.

Fully equipped; all the latest improvements; includes Generator, Purifiers, and Holder. Can be removed to any part of the country, and set up at small cost. For further information apply to BRADFORD GAS LT. & HEATING CO., Dunkirk, N. Y

FRIEDRICH LUX,

Ludwigshafen am Rhein and London.

Lux Mass

GAS GOVERNORS,

Gas Balance.

6 PER CENT.

First Mortgage Bonds

ON GAS WORKS

SITUATED IN GROWING WESTERN TOWNS.

Principal and Interest Guaranteed.

INTEREST SEMI-ANNUALLY.

For sale by the undersigned, who will furnish all necessary information regarding them.

JOS. R. THOMAS, 42 Pine St., N. Y. City.

Fuel and Its Applications.

By E. J. MILLS, D.Sc. F.R.S., and F. J. ROWAN, C.E., assisted by others, including Mr. F. P. Dewey, of the Smithsonian Inst., Wash., D. C.

7 PLATES, AND 607 OTHER ILLUSTRATIONS. ROYAL OCTAVO, PAGES XX, 802. HANDSOME CLOTH, **$7.50.**

A. M. CALLENDER & CO., 42 Pine St., N. Y.

GEROULD'S

System Gas Bookkeeping.

Approved and adopted by many of the prominent Gas Engineers of the Country.

Sample Sheets and Price-List furnished free on application to

L. P. GEROULD, - - Mendota Ill.

CHICAGO GAS STOVE CO.

MANUFACTURERS OF ALL KINDS OF

Gas Cooking and Heating

APPLIANCES.

117-119 Lake St., CHICAGO.

Send for Catalogue.

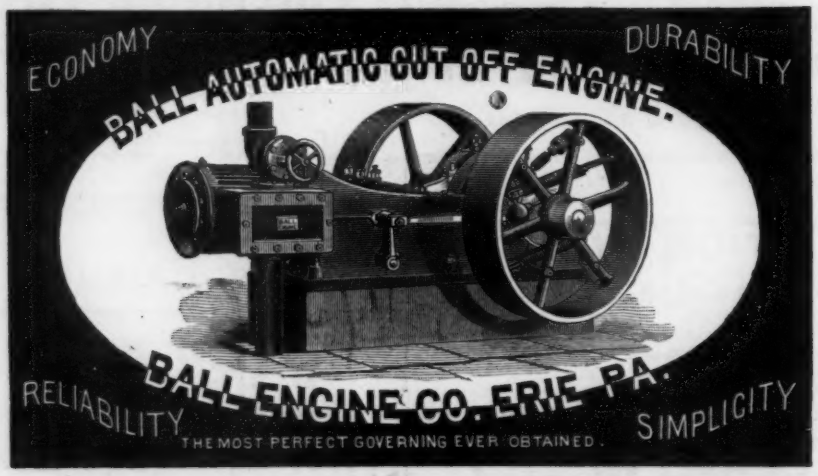
GASHOLDER PAINT.

Use Only

THE GOVERNMENT WATERPROOF PAINT.

Proof against Ammonia, and Absolutely Waterproof. Send for Prices and Particulars.

THE GOVERNMENT WATERPROOF PAINT CO., 122 Milk Street, Boston, Mass.



Bartlett Street Lamp Mfg. Co.

MANUFACTURERS OF

Globe Lamps,

FOR

Streets, Parks, Public Buildings, Railroad Stations, etc.

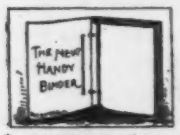
LAMP POSTS

A Specialty.

Office and Salesroom,

40 & 42 COLLEGE PLACE, - - N. Y. CITY.

Gas Companies and others intending to erect Lamps and Posts will do well to communicate with us.



THE NEW HANDY BINDER.

This article may be described as elegant in appearance, strong, durable, and possessing many special qualities of its own. It allows the opening of the pages perfectly flat, whether one or several numbers are in the binder Any number can be taken out and replaced without disturbing he others. The papers are not mutilated for subsequent binding in permanent form. The binder is supplied with gilt side title, and is an ornament to any desk or reading table. The JOURNAL, filed in the Handy Binder, becomes a volume of great value, always convenient for instant reference. **Handy Binder, Postage paid, $1.00.**

A. M. CALLENDER & CO., 49 Pine St., N. Y.

The Miner Street Lamps.

Jacob G. Miner,

No. 823 Eagle Ave., New York, N. Y.

GREENOUGH'S

"DIGEST OF GAS LAW."

Price, $5.00.

This is a valuable and important work, a copy of which should be in the possession of every gas company in the country, whether large or small. As a book of reference it will be found invaluable. It is the only work of the kind which has ever been published in this country, and is most complete. Handsomely bound. Orders may be sent to

A. M. CALLENDER & CO.,

49 Pine Street, N. Y.

EDGEWATER LIME WORKS

Chas. F. McKenna, Proprietor.

SHELL LIME.

Lime by the Cargo for Gas Purification.

EDGEWATER, BERGEN CO., N. J.

Write for Testimonials and Prices.

Simpkin & Hillyer

RICHMOND, VA.

MANUFACTURERS OF

Gas Works Apparatus

BENCH CASTINGS, CONDENSERS,

Scrubbers, Purifiers, Dry Center Seals,

FOUR-WAY VALVES, GAS VALVES,

SULPHATE OF AMMONIA APPARATUS, TANKS, ENGINES, BOILERS, PUMPS, ETC., ETC.

Plans, Specifications and Estimates furnished for new works, or alteration of old works. Correspondence solicited. Works, Newport News, Va.

GAS vs. ELECTRIC LIGHT.

We would invite attention to the able and exhaustive argument of General A. Hickenlooper, President of the Cincinnati Gas Light and Coke Company, contained in a handsome pamphlet of 96 pages, entitled

"EDISON'S INCANDESCENT ELECTRIC LIGHTS FOR STREET ILLUMINATION. REPORT OF AN ARGUMENT DELIVERED BY A. HICKENLOOPER BEFORE THE COMMITTEE ON LIGHT, MUNICIPAL COUNCIL, CITY OF CINCINNATI, JULY 22, 1886."

This is a subject of special interest to all Gas Light Companies.

Prices.

25 copies.....	$7.50	100 copies.....	$22.50
50 copies.....	12.50	250 copies.....	50.00

A sample copy will be sent by mail on receipt of 50 cts.

A. M. CALLENDER, & CO., 49 PINE ST., N. Y. CITY

PATENTS.

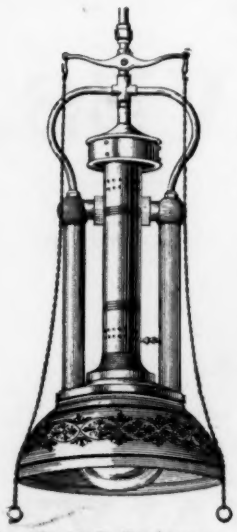
FRANKLIN H. HOUGH

Solicitor of American & Foreign Patents.

925 F. ST., WASHINGTON, D. C.

(NEAR U. S. PATENT OFFICE.)

Personal attention given to the preparation and prosecution of applications for Letters Patent. All business before the U. S. Patent Office attended to for moderate fees. **No Agency in the United States possesses superior facilities for obtaining Patents,** or for ascertaining the patentability of inventions. Copies of patents furnished for 25 cents each. Correspondence solicited.

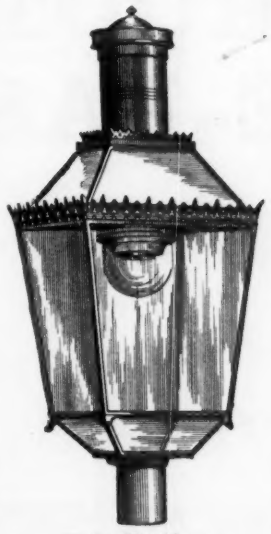

Gordon Portico Lamp.

The Gordon Portico Lamp.

A successful Competitor of the Arc Electric Light for lighting Store Fronts, Show Windows, Depots, Railway Sheds, etc., etc.

The Gordon Street Lamp.

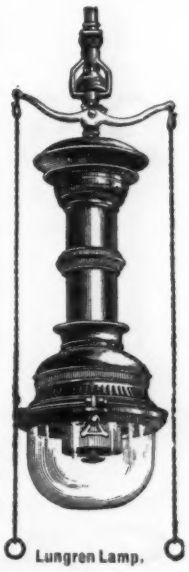
A Successful Competitor of the Arc Electric Light for lighting Streets, etc., etc.


Gordon Street Lamp.

The Lungren Lamp.

A Successful Competitor of the Incandescent Electric Light for Interiors, etc. Is especially applicable for the lighting of Offices, Stores Factories, Mills, Show Windows, Libraries, and all situations where an increased illumination is desired.

More than 25,000 Lungren Lamps are now in use. Testimonials, references, or any desired information will be cheerfully given.


Lungren Lamp.

THE SIEMENS-LUNGREN CO., N.E. Cor. 21st St. & Washington Av., PHILADELPHIA.

WELSBACH SYSTEM
OF
Incandescent Gas Lighting.

OFFICE, DREXEL BUILDING, PHILA., PA.

At the Fall Session of the Board of Supervisors of Winnebago County, held at the County Court House, Oshkosh, Wis., Nov. 26, 1889, the report submitted by Mr. C. W. Cook, Chairman of the Committee on Public Buildings, recommending the use of the Welsbach Incandescent Gas Burner in the Buildings under their charge, was unanimously adopted, because of the extreme economy in the consumption of Gas and the superior character of the light obtained.

JEWEL GAS STOVES

MANUFACTURED BY

GEORGE M. CLARK & COMPANY,

Nos. 157 & 159 Superior Street, - - - Chicago, Ill.

EVERY CONCEIVABLE SIZE AND STYLE,

Ranging in Prices from $1.50 to $30.00.

WE USE NO GAS COCKS.

All Flames are Regulated by a Direct Needle Valve.

The JEWEL

IS THE

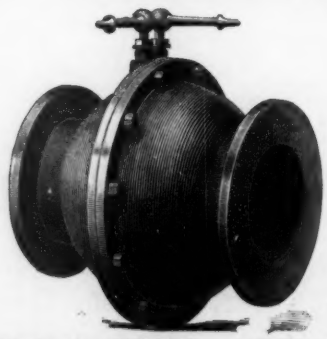
Only Well-Made Gas Stove on the Market.

Write for our 1890 Catalogue and see for yourself.

ROOTS'
GAS AND BYE-PASS VALVES.

GAS VALVE

Quick Acting,
Simple,
Efficient, Durable.

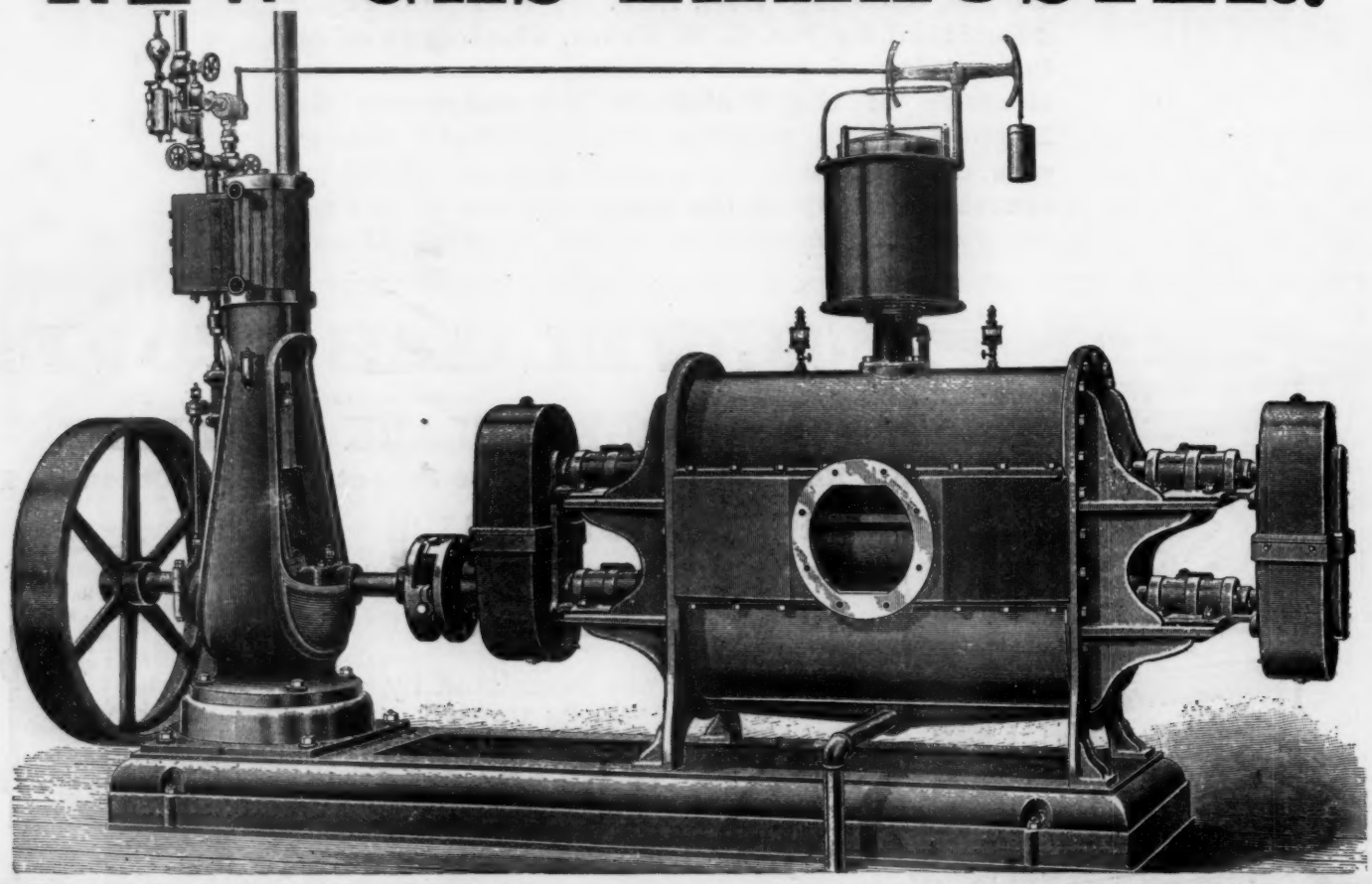


BYE-PASS VALVE.

Automatic Action,
Reliable,
Simple, Durable.

Thousands now in use and giving perfect satisfaction. Write for Catalogue and Prices.

ROOTS'
NEW GAS EXHAUSTER.

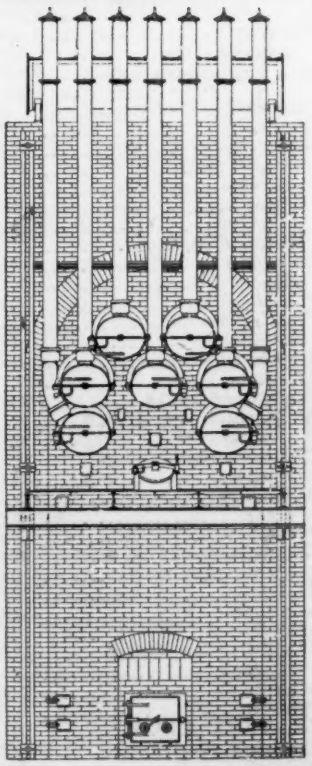


THE P. H. & F. M. ROOTS CO., Patentees and Manufacturers, **CONNERSVILLE, IND.**

S. S. TOWNSEND, Gen. Agt., 22 Cortlandt St., N. Y. COOKE & CO., Selling Agts., 22 Cortlandt St., N. Y.

THIS SPACE
WILL BE
Occupied Next Month by the
KERR MURRAY MFG. CO.
FORT WAYNE, IND.
GAS WORKS
APPARATUS
AND
HOLDERS.

LACLEDE FIRE BRICK MANUFACTURING COMPANY,

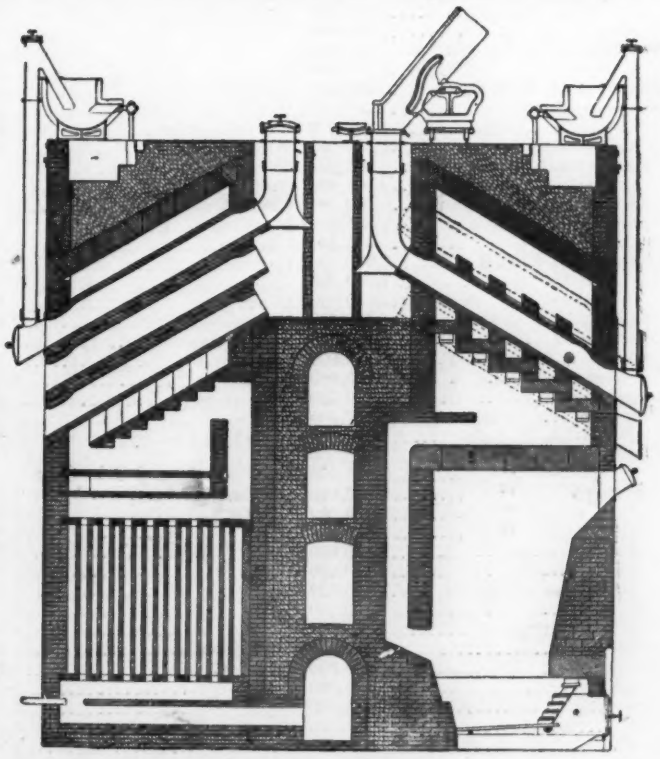


ST. LOUIS, MO.

Exclusive Agents in the United States
FOR THE
Coze System of
Inclined Retorts.

IT IS THE COMING BENCH
FOR MAKING COAL GAS.

It will Save from 50 to 60 per ct. in Labor.



ESTIMATES AND PLANS FURNISHED BY THE
LACLEDE FIRE BRICK MFG. CO., ST. LOUIS, MO.

KIRKHAM, HULETT & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBERS

Erected and in course of construction at present date:

	Capacity. Cubic feet per day.
Altrincham	600,000
Adelaide	600,000
Aldershot	200,000
Allegheny, U. S. A.	1,000,000
Ashton-under-Lyne	1,250,000
Amsterdam	1,500,000
"	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co	200,000
Altoona, U.S.A.	350,000
Buxton	250,000
Bradford	1,000,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,000,000
"	1,000,000
"	3,000,000
Bremen	150,000
Baltimore, U.S.A.	1,000,000
"	1,900,000
"	1,000,000
Balmain, N.S.W	125,000
Bishops Stortford	150,000
Blackpool	400,000
Brussels	1,250,000
"	1,250,000
"	750,000
"	1,250,000
Banbury	250,000
Birmingham	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A.	2,000,000
Brisbane	1,500,000
"	300,000
Burton-on-Trent	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co	20,000
"	20,000
Bombay	400,000
Buffalo, U.S.A., Mutual	750,000
" " Citizen	500,000
Brookline, U.S.A.	500,000
Bergen	350,000
Berlin	1,250,000
Bournemouth	1,000,000
Bridgeport, U.S.A.	500,000
Brunswick	300,000
Beck & Co., St. Louis	100,000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A	1,000,000
"	1,000,000
" Nassau	1,000,000
Brunner, Mond & Co.	400,000
Cheltenham	2,000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A.	500,000
Cincinnati, "	1,500,000
" "	1,500,000
Chicago "	3,000,000
" "	1,000,000
" "	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas Works Co	100,000
Cadiz	300,000
Charlottenburg	600,000
Dudley	750,000
Driffield	100,000
Dukenfield	500,000
Dover	750,000
"	1,000,000
Deal	200,000
Derby	1,500,000

	Capacity. Cubic feet per day.
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A.	350,000
Denver, "	500,000
" "	1,000,000
Dusselldorf	750,000
"	500,000
Dumfries	250,000
Dunedin, N.Z	400,000
Darlington	1,250,000
Detroit, U.S.A	750,000
Edinburgh	1,500,000
"	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshutte	500,000
Furth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W	100,000
Grieg	300,000
Georgetown, U.S.A	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havana, Cuba	750,000
Hastings	1,500,000
Huddersfield	300,000
"	750,000
"	1,500,000
Hof	200,000
Hampton Wick	500,000
Heckmondwicke	500,000
Haverfordwest	100,000
Halifax, N.S.	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A	1,000,000
Ilkeston	300,000
Inverness	250,000
Ilkley	200,000
Ilford	100,000
Kingston-on-Hull	400,000
Kidderminster	750,000
Kidsgrove	100,000
Konigberg	1,000,000
King's Lynn	300,000

LONDON:—

The Gaslight and Coke Co.:	
Beckton	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	2,500,000
"	2,500,000
Silvertown	1,000,000
Bromley	2,000,000
"	1,500,000
"	1,500,000
"	1,500,000
"	2,000,000
"	1,500,000

LONDON—*Continued.*	Capacity. Cubic feet per day.
Shoreditch	2,500,000
Pancras	1,500,000
"	1,500,000
Pimlico	2,000,000
Nine Elms	3,000,000
"	3,000,000
South Metropolitan Co:—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall	3,000,000
"	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
Leeds	2,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	2,000,000
Leominster	150,000
Leiden	560,000
"	600,000
Liverpool	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	3,000,000
Lincoln	1,000,000
"	600,000
Lowell, U. S. A	1,000,000
Louisville "	1,500,000
Long Eaton	500,000
Lilie	900,000
"	450,000
"	750,000
"	250,000
"	250,000
Luckenwalde	330,000
Liegwitz	300,000
Lincoln, U. S. A	250,000
Lawrence "	500,000
Lynn "	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles	1,500,000
"	1,500,000
Mons	500,000
Malines	250,000
Melbourne	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
Manchester	2,500,000
Middleton	400,000
Manley, N. S. W.	100,000
Minneapolis, U. S. A	750,000
Magdeburg	300,000
Memphis, U. S. A	750,000
Nottingham	1,250,000
"	2,500,000
"	2,500,000
"	2,000,000
"	1,500,000
"	2,000,000
Newport, U.S.A	430,000
Newmarket	150,000
Newark, U.S.A	680,000
Northfleet	200,000
New York, U.S.A	2,000,000
Nice	600,000
Newcastle, N. S. W.	200,000
Numea, "	100,000
Namur	250,000
Newark	350,000
Oldbury	500,000
Otley	200,000
Oswestry	250,000

	Capacity. Cubic feet per day.
Ober Schlesian	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N. S. W	100,000
Prescott	150,000
Providence, U.S.A.	750,000
"	750,000
Plauen	300,000
"	300,000
Portsmouth	2,500,000
"	2,500,000
Pittsburgh, U.S.A.	1,500,000
Portland, "	560,000
Pawtucket, "	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A	250,000
Roxbury, "	500,000
Runcorn Soap Co.	20,000
Rockhampton, N. S. W.	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach	200,000
Salford	1,750,000
"	1,750,000
"	1,750,000
Smethwick	750,000
Sydney, N. S. W	1,000,000
"	1,000,000
"	2,500,000
"	50,000
"	50,000
Sunderland	1,500,000
St. Josephs, U.S A	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg	2,000,000
"	1,500,000
St. Louis, U.S.A	2,000,000
"	2,000,000
"	1,000,000
Laclede	1,000,000
Silesian Coal Co.	600,000
San Francisco, U.S.A	2,000,000
"	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A	750,000
Toronto	1,000,000
Uxbridge	300,000
Valparaiso	500,000
West Bromwich	1,000,000
Willenhall	250,000
Weston-super-Mare	500,000
Waltham	150,000
Wormwood Scrubs	300,000
Williamsburg, U.S.A	600,000
"	600,000
Wellington	150,000
Warwick	300,000
Wheeling, U.S.A	500,000
Walker	300,000
Westgate	100,000
Wilmington, U.S.A	500,000
Windsor, N. S. W.	100,000
Wolverton	100,000
Wellington, N. Z.	250,000
Whitchurch	175,000
Washington, U.S.A	2,000,000
Wallasey	750,000
Weimar	150,000
Wurzen	200,000
Worcester, U.S.A	750,000
Yeadon	500,000
Yeovil	250,000

SOLE AGENT FOR WESTERN HEMISPHERE,

GEO. SHEPARD PAGE, 69 WALL STREET, NEW YORK.

THE UNITED

GAS IMPROVEMENT CO.

DREXEL BUILDING, PHILADELPHIA.

OFFICERS:

WILLIAM W. GIBBS, President.
GEORGE PHILLER, Vice-President.
SAM'L T. BODINE, Gen'l Manager.
RANDAL MORGAN, Gen'l Counsel.

EDWARD C. LEE, Sec'y and Treas.
ALEX. C. HUMPHREYS, Gen'l Supt.
WALTON CLARK, Ass't Gen'l Supt.
H. H. EDGERTON, Chem. and Eng'r.

DIRECTORS:

GEORGE PHILLER, THOMAS DOLAN, HENRY C. GIBSON, WM. T. CARTER, WILLIAM G. WARDEN, SAM'L T. BODINE.

BUILDERS, LESSEES AND PURCHASERS OF

GAS WORKS.

Orders solicited from Large Cities, Small Towns, Mills, Institutions, from all who want more Light for Less Money.

NATIONAL GAS LIGHT AND FUEL COMPANY,

No. 218 La Salle Street, Chicago.

THE SPRINGER SYSTEM

OF

Fuel and Illuminating Water Gas Works.

REFERENCES.

People's Gas Lt. & Coke Co..Chicago, Ill.
Illinois Light, Heat & Power Co.....Chicago, Ill
Elgin National Watch Co...Elgin, Ill.
C. R. I. & P. R. R. Shops..Chicago, Ill.
Decatur Gas Lt & Coke Co..Decatur, Ill.
Niles Gas Light Co.....Niles, Mich.
Newton Illuminating Co....Newton, Kansas.
Wellington Light & Heat Co..Wellington, Kansas.
Chippewa Falls Gas Lt. Co..Chippewa Falls, Wis.
Elkhart Gas Lt & Coke Co..Elkhart, Ind.
Madison City Gas Light Co.Madison, Wis.
South Bend Gas Light Co..South Bend, Ind.
Sheboygan National Gas Co.Sheboygan, Wis.
Salina Gas Light Co.....Salina, Kansas.
The Rathbun Co ..... Deseronto, Prov. Ont.
Jefferson City Gas Lt. Co ..Jefferson City, Mo.
Mankato Gas Light Co.....Mankato, Minn.
Lima Gas Light Co.. .....Lima, Ohio.

Minneapolis Gas Light and Coke Co.. .....Minneapolis, Minn.
Bellevue Water and Fuel Gas Light Co..... } Bellevue, Campbell County, Ky.
Bucyrus Gas Lt. & Fuel Co.Bucyrus, Ohio.
Morris Gas Co.....Morris, Ill.
Los Angeles Gas Co.....Los Angeles, Cal.
San Diego Gas Fuel & Electric Lt. Co.....San Diego, Cal.
Sioux Falls Gas Co.....Sioux Falls, Dak.
Dakota Gas and Fuel Co...Grand Forks, Dak.
St. Johns Mutual Gas Co...St. Johns, Mich.
Stillwater Gas Light Co....Stillwater, Minn.
St. Paul Gas Light Co .....St. Paul, Minn.
Emporia Electric and Gas Light Co.....Emporia, Kas.
Van Wert Gas Light Co.. ..Van Wert, Ohio.
Lansing Gas Light Co.....Lansing, Mich.
San Francisco Gas Lt. Co...San Francisco, Cal.

Shelbyville Gas Light Co...Shelbyville, Ind.
Great Falls Gas Light Co.. Great Falls, N. H.
Belleville Gas Co.....Belleville, Ontario
Rochester Lt. and Fuel Co..Rochester, Minn.
Northwestern Gas Light and Coke Co..... .....Evanston, Ill.
Lincoln Gas Light Co.....Lincoln, Neb.
Davenport Gas Light Co ...Davenport, Iowa.
Municipal Gas Co.....Albany, N. Y.
Alliance Gas Light Co.....Alliance, Ohio.
New Gas Light Co.....Janesville, Wis.
Chicago Gas Lt. & Coke Co., Chicago, Ill.
Joliet Gas Co.....Joliet, Ills.
Superior Light & Fuel Co..Superior, Wis.
Kewanee Gas Light Co....Kewanee, Ill.
Aberdeen Light & Fuel Co..Aberdeen, So. Dak.
Pierre Light and Fuel Co..Pierre, So. Dak.
*Standard Gas Light Co....New York City.
*Carlinville Gas Light Co..Carlinville, Ill.

* Building.

GUARANTEED ESTIMATES of Cost of Gas Furnished on Application.

GASHOLDER TANK CONSTRUCTION, ETC.

Gas Companies and others about to erect Gasholders will find it profitable to consult W. C. Whyte, who for over 30 years has made a specialty of

Tank Excavation and Mason Work.

Fifty Tanks now in operation show the sort of work done. Address

W. C. WHYTE, - No. 15 Cortlandt Street, N. Y. City.

CONNELLY & CO.,

SOLE MANUFACTURERS OF THEIR PATENTED SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying agent ever offered as a substitute for lime. Now used *in every State in the Union*, and purifying daily over *thirty-five million cubic feet.* Should be used in every gas works. Its own saving will pay for it many times over.

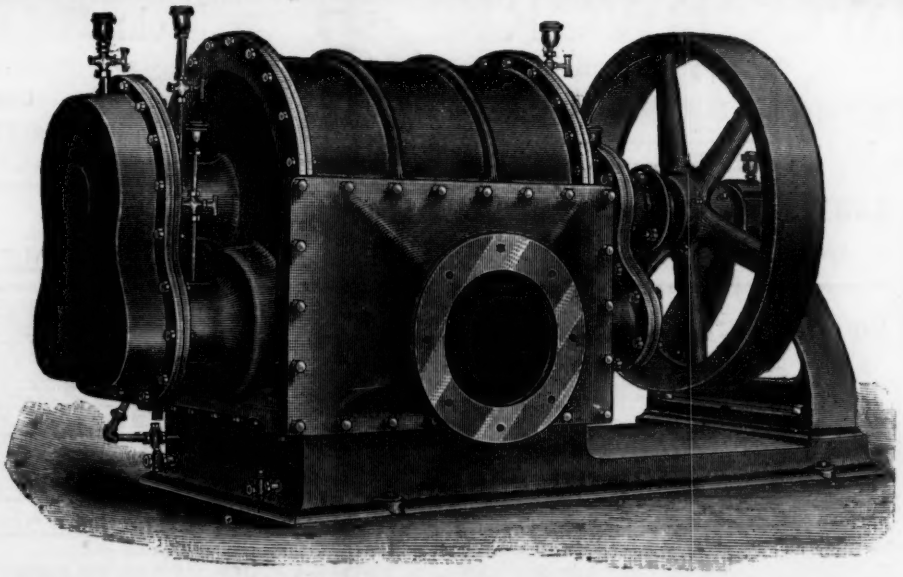
AUTOMATIC GOVERNOR. Has been on the market but *three years*, and in that time has been introduced *more generally* than any invention ever designed for use in gas works. Over *two hundred* of them now in use. Sensitive; reliable; perfectly automatic; reduces leakage; satisfies consumers, and gives great relief to the Manager. No gas works is *complete* without one of these machines.

STEAM JET EXHAUSTER. Designed particularly for small works Combines Exhaust Tube, Steam Governor Gas Compensator, and Bye-Pass Valves in the most compact form possible; occupies but little space; uses very little steam; operated by ordinary workmen; saves formation of carbon in retorts; increases yield 10 to 15 per cent. Specially adapted for *mixing air* with oil gas. *No works* too small to use them profitably.

Prices given on all our specialties *delivered at any point in the United States.* Correspondence solicited.

CONNELLY & CO., No. 111 Broadway, New York City.

WILBRAHAM GAS EXHAUSTER



WILBRAHAM BROS.,

PHILADELPHIA, PA.

JARVIS ENGINEERING CO.,

61 Oliver St., Boston, Mass.

CONTRACTORS FOR ERECTING

COMPLETE STEAM OUTFITS FOR ELECTRIC LIGHTING STATIONS.

Steel Boilers set with Jarvis Pat. Boiler Setting

To burn **COKE SCREENINGS** for Fuel.

ARMINGTON & SIMS CO. ENGINES,

Belting direct to Dynamos, without using Shafting.

SEND FOR CIRCULARS.

REFERENCES.—Charlestown Gas & Electric Light Co., Charlestown, Mass.; Schenectady Gas & Electric Light Co., Schenectady N. Y.; Brookline Gas Co., Brookline, Mass.

Practical Electric Lighting

By A. BROMLEY HOLMES, A.M.I.C.E.

With 87 Illustrations. Third Edition. **Price, $1.00.**

Electric Light Primer.

By CHARLES L. LEVEY.

A simple and comprehensive Digest of all the most important facts connected with the running of the Dynamo and Electric Lights, with Precautions for Safety, etc.

Price, 50 cents.

A. M. CALLENDER & CO., 42 Pine St., N.Y.

(Patented.) **IMPORTANT!** (Patented)

NEW SOLVENT FOR GAS PIPE DEPOSITS.

Economical and Effective.

MAAS & WALDSTEIN, 44 Trinity Place and 81 Greenwich St., N. Y.

Gasholder Tanks & Gas Works Masonry Complete.

PLANS PREPARED AND ESTIMATES FURNISHED AT SHORT NOTICE.

J. P. WHITTIER, - - 499 Wythe Av., Brooklyn, N. Y.

CHAPMAN VALVE MANUFACTURING CO.,

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants With and Without Independent Nozzle Valve. All Work Guaranteed.

WORKS & GEN'L OFFICE: Indian Orchard, Mass.

TREASURER'S OFFICE: 72 Kilby & 112 Milk Sts, Boston, Mass.

Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER,

FOR UTILIZING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

H. E. PARSON. Supt., 33 & 35 Liberty St., N.Y

MILLS' REVERSIBLE LIME TRAY,

AND

WOODWORK

Of Every Description

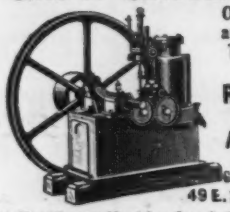
NEEDED BY GAS WORKS.

SEND FOR CIRCULAR AND PRICE LIST TO

BARTLETT, HAYWARD & CO.,

Pratt and Scott Streets, Baltimore, Md.

VAN DUZEN GAS & GASOLINE ENGINE



OPERATED with COAL and OTHER MANUFACTURED GASES AND GASOLINE.

RELIABLE AND ECONOMICAL.

Fully Warranted

VAN DUZEN Gas & Gasoline Engine Co. 49 E. 2d St., Cincinnati, O.

A. MacKinnon Machine Co., Agts., 22 Warren St., N.Y.

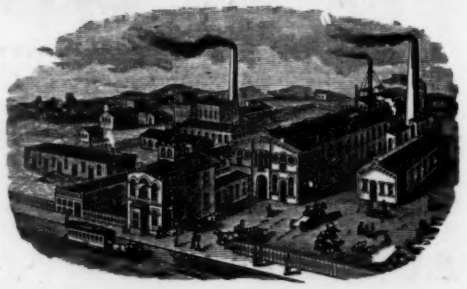
The Management of Small Gas Works.

BY C. J. R. HUMPHREYS.

Price, $1.

Orders to be sent to **A. M. CALLENDER & CO.,** 42 PINE STREET, NEW YORK.

LUDLOW VALVE MFG. CO.

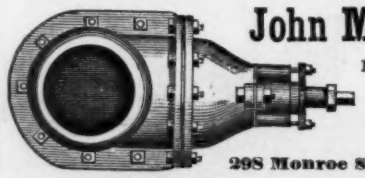


OFFICE AND WORKS,

938 to 954 River Street and 67 to 83 Vail Av., TROY, N. Y.

Hydraulic Main Dip Regulators, also Check Valves, Foot Valves, Yard-wash and Fire Hydrants. Send for Circulars.

Valves.—Double and Single Gate, ½ in. to 48 in., outside and inside Screws. Indicator, etc., for Gas, Water, Steam, and Oil. Send for Circulars.



John McLean

Man'facturer

GAS VALVES.

298 Monroe Street, N. Y.

SPECIAL TRAYS FOR IRON SPONGE OR OXIDE OF IRON.

CHURCH'S TRAYS A SPECIALTY.

REVERSIBLE-STRONGEST-MOST DURABLE-MOST EASILY REPAIRED.

JOHN CABOT. TRAYS FOR GAS WORKS.

306-310 ELEVENTH AVENUE, NEW YORK.

WE ALSO MAKE THE CHEAPEST AND STRONGEST REVERSIBLE BOLTED TRAYS IN THE MARKET.

THE CLERK GAS ENGINE CO.,

Main Office, 1012, 1014, 1016, 1018 Filbert St., Philadelphia, Pa.

WM. W. GOODWIN, Prest. E. STEIN, Sec. S. LEWIS JONES, Asst. Sec. A. J. DOTY, Supt.

The utility and convenience of the Gas Engine being no longer an open question, it only remains now for intending purchasers to select the BEST. We claim for the CLERK GAS ENGINE that it is equal to any other manufactured as regards steadiness in running, simplicity, and ease of keeping in repair, and that it gives the greatest amount of power for the least money (both in first cost and expense of running) of any engine made. In support of this claim we refer to the test of the Gas Engines made under the direction of the American Institute of New York, in December, 1885, and heretofore published in these columns. These engines are especially adapted for continuous running under heavy loads, and we can refer to Engines which have run 22 hours a day for months at a time

Made in Sizes of 5 10 15 20, and 25 Horse Power. All Engines Guaranteed for One Year.

GAS STOVES. GAS METERS. GAS STOVES.

THE AMERICAN METER CO.,

MANUFACTURERS OF

Standard 3 Diaphragm Dry Meter

GAS METERS,

Station Meters,

METER PROVERS, PHOTOMETERS,

PRESSURE GAUGES OF ALL KINDS,

AND

Standard 2 Diaphragm Dry Meter.

Apparatus for Testing the Quantity and Quality of Gases.

GAS STOVES FOR HEATING AND COOKING

Sole Agents in the United States for

Verity's Patent Gas Fires.

Circulars and Price Lists on Application.

MANUFACTORIES,

508 to 514 West Twenty-second St., N. Y. Arch and Twenty-second St., Phila

Nos. 244 & 246 North Wells Street, Chicago, Ill.

AGENCIES,

No. 177 Elm Street, Cincinnati, Ohio. No. 222 Sutter Street, San Francisco, Cal

No. 810 North Second Street, St. Louis, Mo.

STOVE SHOW ROOMS, No 242 Sixth Avenue, New York City

RETORTS AND FIRE BRICK. RETORTS AND FIRE BRICK. RETORTS AND FIRE BRICK.

J. H. CAUTIER & CO.,
CORNER OF
GREENE AND ESSEX STREETS,
JERSEY CITY, N. J.
MANUFACTURERS OF
Clay Gas Retorts,
Gas House Tiles,
Fire Bricks, Etc. Etc.
Ground Clay, Fire Brick and Fire Sand in Barrels,
J. H. GAUTIER. C. E. GREGORY. C. E. GAUTIER.

BROOKLYN
Clay Retort & Fire Brick Works,
(EDWARD D. WHITE & CO.)
Manufacturers of Clay Retorts, Fire Brick, Gas House and other Tile.
VAN DYKE, ELIZABETH, RICHARDS & PARTITION STS.
Office, 88 Van Dyke St., Brooklyn, N. Y.

LACLEDE FIRE BRICK MFG. CO.,
MANUFACTURERS OF
Fire Brick, Gas Retorts,
AND
ST. LOUIS STANDARD SEWER PIPE.
Blast Furnace and Cupola Linings, every description of Fire Clay Material, Fire Clay Flue Linings, Chimney Tops Dry Milled and Crude Fire Clays, etc.
OFFICE AND DEPOT
901, 903, and 905 Pine Street,
ST. LOUIS, MO.

ESTABLISHED IN 1845.
B. KREISCHER & SONS,
OFFICE FOOT OF HOUSTON ST., E.R., N.Y.
Gas Retorts,
TILES, FIRE BRICK.
AND EVERYTHING IN THE FIRE CLAY LINE.

MANHATTAN
FIRE BRICK & ENAMELLED CLAY
RETORT WORKS
ADAM WEBER.
CLAY GAS RETORTS
AND RETORT SETTINGS
FIRE BRICKS, TILES, ETC.,
Office and Works, 15th Street and Avenue C., N. Y.

Works, LOCKPORT STATION, PA.
—ESTABLISHED 1864.—
JAMES GARDNER, JR.,
Office, Rooms 19 & 20, Lewis Block, PITTSBURGH, PA. P. O. Box 373.
Successor to WILLIAM GARDNER & SON.
Fire Clay Goods for Gas Works.
H. A. NORTON, No. 4 CENTRAL STREET, BOSTON, MASS., Agent for the New England States.

GEO. C. HICKS, Prest. **CHICAGO** CHAS. A. REED, Sec. & Treas.
Retort and Fire Brick Co.,
MANUFACTURERS OF
Fire Clay Goods of all Kinds,
AND BEST QUALITY ONLY.
Regenerative Furnaces & Water Gas Goods.
45th St., Clark to La Salle, Chicago.

GEROULD'S IMPROVED RETORT CEMENT.
A Cement for patching retorts, putting on mouthpieces, and making up all bench-work joints. This Cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick. For recommendations and price list address
C. L. GEROULD & CO.,
5 & 7 Skillman St., Brooklyn, N. Y.
Western Agent, H. T. GEROULD, Mendota, Ill.

Parker-Russell Mining and Mfg. Co.,
CITY OFFICE: Merchants-Laclede Bldg., Rooms 307 & 308, Broadway and Locust Street, St. Louis, Mo.
PROPRIETORS OF THE
OAKHILL GAS RETORT & FIRE BRICK W'KS
Our immense establishment is now employed almost entirely in the manufacture of materials for
GAS COMPANIES.
We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying.
We furnish and build Half-Depth or Full REGENERATOR FURNACES of different kinds and most approved styles.
Correspondence solicited.

THOS. SMITH, Prest. AUGUST LAMBLA, Vice-Prest. & Supt.
BALTIMORE
RETORT & FIRE BRICK CO.
MANUFACTORY AT
LOCUST POINT, BALTIMORE, MD.
Clay Retorts, Blocks & Tiles,
FIRE BRICK, FIRE CLAY,
AND FIRE CEMENT.
Red and Buff Ornamental Tiles and Chimney Tops. Drain and Sewer Pipe (from 2 to 30 inches). Baker Oven Tiles 12x12x2 and 10x10x2.
WALDO BROS., 88 WATER ST., BOSTON, MASS
Sole Agents the New England States.

1889 DIRECTORY 1889
OF THE GAS LIGHT COMPANIES of the UNITED STATES & CANADA.
Price, ... $8.00.
A. M. CALLENDER & CO., No. 42 Pine Street, N. Y. City.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.

OFFICE, 418 to 422 East 23d St., N. Y.

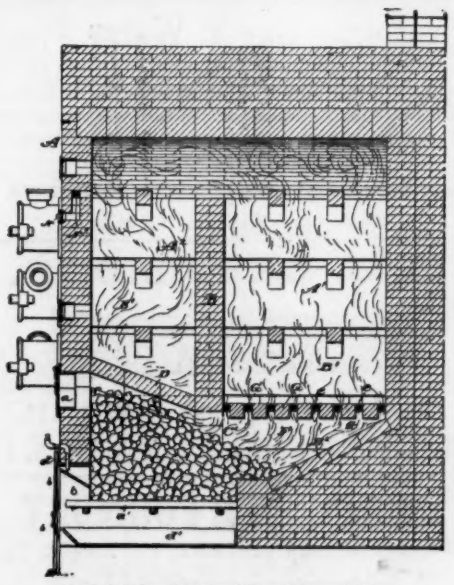
Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

FLEMMING'S

Generator-Gas Furnace



Materials furnished and Benches erected by

J. H. GAUTIER & CO., - Jersey City, N. J.

Address as above, or D. D. FLEMMING, Jersey City, N. J.

FRED. BREDEL,

CONTRACTOR FOR THE COMPLETE

Erection and Equipment of Gas Works.

SOLE PROPRIETOR OF THE

KLOENNE PATENTS

FOR NORTH AMERICA.

REGENERATIVE FURNACES.

(900 Retorts are now fired in America by the Kloenne-Bredel System.)

SELF-SEALING MOUTHPIECES.

(Over 800 Now in Use.)

Standard Condensers. Washer-Scrubbers.

TAR WASHERS FOR WATER GAS PLANTS.

(In use in the works of the Chicago Gas Lt. Co.)

GASHOLDERS.

Bredel's Automatic Gas Governor.

Refers, by permission, to Mr. Eugene Vanderpool, Newark, N. J.; Mr E. G. Cowdery, Milwaukee, Wis.; and Mr. Theo. Forstall, Chicago, Ills. For further infomation, address

FRED. BREDEL,

No. 208 East Seventeenth Street, N. Y. City.

COMPOUND Condensing or Non-Condensing.
16 SIZES, 5 to 500 H. P.
Not yet equaled by any form of Engine for
HIGH FUEL DUTY AND SIMPLICITY.

STANDARD 13 Sizes in Stock. 5 to 250 H. P.
3000 in use in all parts of the Civilized World.

JUNIOR 6 Sizes in Stock, 5 to 50 H. P.
An Automatic Engine cheaper than a Slide Valve.
WELL BUILT. ECONOMICAL. RELIABLE.
Over 300 Sold the First Year.

All the above built strictly to Gauge with
INTERCHANGEABLE PARTS.
REPAIRS CARRIED IN STOCK.
SEND FOR ILLUSTRATED CATALOGUES.

WESTINGHOUSE ENGINES

The Westinghouse Machine Co.
PITTSBURGH, PA. U.S.A.

SELLING DEPARTMENT IN THE UNITED STATES.

New York,	17 Cortlandt St.	Westinghouse, Church, Kerr & Co.
Boston,	Hathaway Building,	
Pittsburgh,	Westinghouse Build'g,	
Chicago,	156, 158 Lake St.	
Philadelphia,	608 Chestnut St.	M. R. Muckle, Jr. & Co.

ST. LOUIS,
511 NORTH FOURTH ST.,
Westinghouse, Church, Kerr & Co.

Salt Lake City, Butte, Mont.	259 S. Main St. 1. Granite St.	Utah & Montana Machinery Co.
San Francisco,	21, 23 Fremont Street,	Parke & Lacy Co.
Portland, Or.	33, 35 N. Front St.	Parke & Lacy Mch. Co.
Charlotte, N. C. Atlanta, Ga.	36 College St. 45 S. Prior St.	The D. A. Tompkins Co.
Dallas, Tex.		Keating Imp. & Machine Co.
Chattanooga, Tenn.,		C. E. James & Co.

Newbigging's Handbook for Gas Engineers and Managers.

The present (the fifth) edition marks an important advance on those that have gone before. Considerable additions have been made to the text, and much of it has been re-written and otherwise improved. It extends to 524 pages, and contains 193 illustrations. **Price, Cloth, $6.00.**

A. M. CALLENDER & CO., - - - - No. 42 Pine Street, N. Y. City.

GAS AND WATER PIPES. GAS AND WATER PIPES. ENGINEERS.

SAM'L R. SHIPLEY, Pres.
HENRY B. CHEW, Tre

JAS. P. MICHELLON, Sec.
WM. SEXTON, Supt.

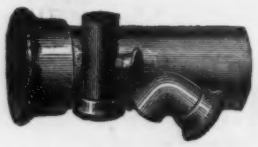
GLOUCESTER IRON WORKS,
GLOUCESTER CITY, N. J.

Cast Iron Gas & Water Pipes, Stop Valves, Fire Hydrants, Gasholders, &c.

Office, Rooms 61 and 63 Bullitt Building, 131 S. 4th St., Phila., Pa.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.



New York Office, 160 Broadway.

CAST IRON WATER AND GAS PIPE,

FROM TWO TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

DENNIS LONG & COMPANY,

LOUISVILLE, KY.,

Manufacture Exclusively

CAST IRON GAS & WATER PIPE & SPECIAL CASTINGS
OF ALL SIZES.

King's Treatise on Coal Gas.

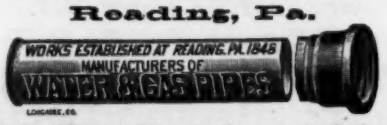
A stan ard text-book for the Engineers and Managers of Gas Works, and for all who are concerned or take an interest in the manufacture and distribution of Coal Gas, and in the utilization of the Secondary Products resulting thereform; treating also of the Gas Engine, and of Gas Cooking and Heating Appliances.

In 3 Vols. Price per Vol., $10. Sold either by Volume or in Sets.

A. M. CALLENDER & CO., 42 Pine St., N. Y.

P. D. WANNER, Chairman. A. H. MELLERT, Mangr. of Wks.
R. B. KINSEY, Secretary. F. A. KNOPP, Treasurer.

MELLERT FOUNDRY & MACHINE CO. Ltd.
and READING FOUNDRY CO., Ltd.
Reading, Pa.



Specials—Flange Pipe, Valves and Hydrants
Lamp Posts, Retorts, etc.
General Foundry and Machine Work.
JOHN FOX, Selling Agent. 160 Broadway, N.Y.

THE OHIO PIPE COMPANY,
MANUFACTURERS OF
Cast Iron Gas & Water Pipe,
BRANCH AND SPECIAL CASTINGS.
Gas-House Bench Castings, Hydraulics, Lamp Posts, Flange Pipe and Specials, Architectural Castings, Building Columns, Joists, Cellar Grates, Sash Weights, etc.
GENERAL FOUNDERS AND MACHINISTS.
Columbus, Ohio.

M. J. DRUMMOND,

SPECIAL CASTINGS AND LAMP POSTS.
Office, Corbin Building, 192 Broadway, N. Y.

EMAUS PIPE FOUNDRY.
DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF
CAST IRON PIPE AND SPECIAL CASTINGS
FOR WATER AND GAS.

JOS. R. THOMAS,
No. 42 Pine Street, N.Y. City.
CONSULTING AND CONSTRUCTING
Gas Engineer and Contractor.
PLANS, SPECIFICATIONS, AND ESTIMATES FURNISHED.
Contracts taken for all Appliances required at a Gas Works,
Either for New Works or Extensions to Old Plants.

WM. MOONEY
(Successor to WM. FARMER)
No. 94 Liberty St., N Y. City.
GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS WORKS, OR APPARATUS OF ANY CAPACITY.
Plans and Specifications Furnished.

WM. GARDNER,
Gas Engineer,
Lewis Block, Room 20, Pittsburgh, Pa.
Those who intend to make alterations in existing gas plants, or who contemplate the erection of new works, will find it to their interest to open correspondence with the above. Plans mad and Estimates furnished.

ARTLETT, HAYWARD & CO.

Baltimore, Md.

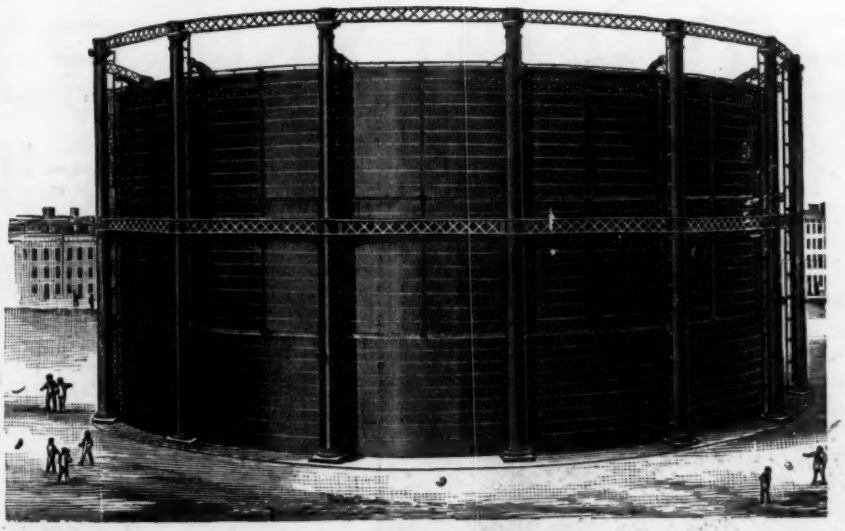
Triple Double, & Single-Lift
GASHOLDERS.

Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS.



PURIFIERS.

CONDENSERS.

Scrubbers.

BENCH CASTINGS.

OIL STORAGE TANKS.

Boilers.

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSABLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

Munich Regenerative Furnace, System Drs. Schilling & Bunte.

HAZELTON BOILERS.

Gas Works Designed and Constructed.

Pascal Iron Works. ESTABLISHED —1821.— Delaware Iron Works.

MORRIS, TASKER & CO.,

INCORPORATED.

OFFICE, 224 SOUTH THIRD STREET, - - PHILADELPHIA, PA.

CONTRACTORS, BUILDERS, AND MANUFACTURERS OF

Gas, Water & Sugar Works

Bench Castings.

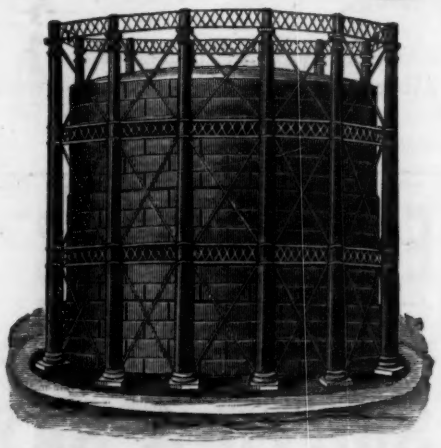
Condensers.

Scrubbers.

Purifiers.

Hyd. Carriages.

Iron Floors,



Iron Roofs.

Street Stops,

Valves, etc.

Stand-Pipes.

Water & Oil

Tanks, all Sizes.

Single, Double, and Triple-Lift Gas Holders.

SELF-SEALING RETORT LIDS. STAMPED STEEL RETORT LIDS.

Locomotive Water Columns, Filters, etc. Boiler Tubes, Wrought Iron Pipe & Fittings

Plans, Specifications and Estimates for all kinds of Machinery furnished on application.

Foundries & Works, MILLVILLE, FLORENCE, and CAMDEN, N. J.

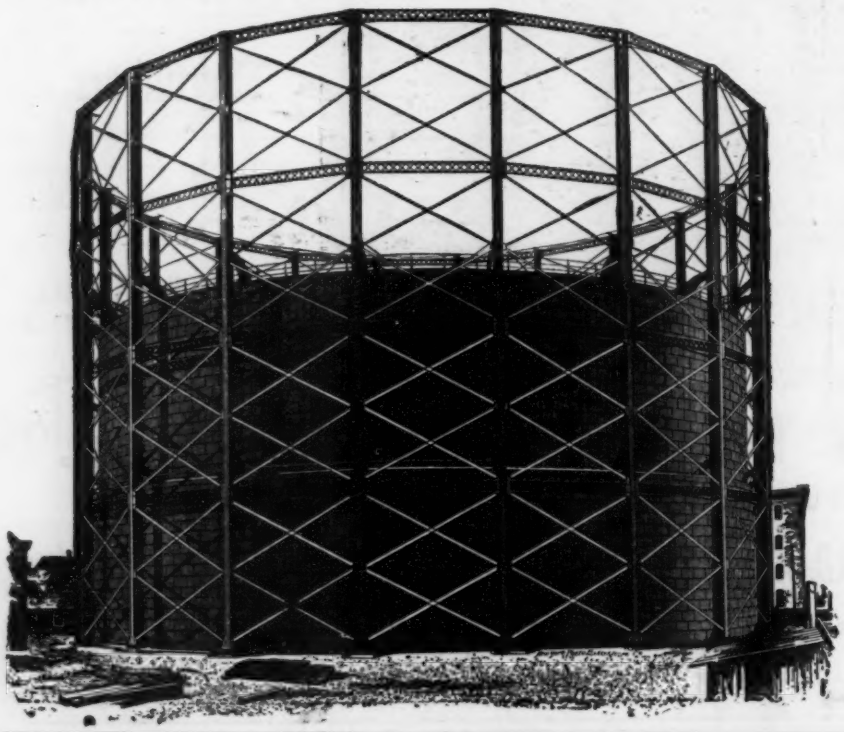
R. D. WOOD & CO.,

Engineers, Iron Founders, and Machinists.

400 Chestnut St., PHILADELPHIA, PA.

MANUFACTURERS OF

CAST IRON PIPE,



Gas Holders,

SINGLE, DOUBLE, AND TRIPLE LIFTS, WITH OR WITHOUT WROUGHT IRON OR STEEL TANKS.

PURIFIERS, CONDENSERS.

Scrubbers.

BENCH WORK.

Iron Floors and Roofs, Plate Girders.

Heavy Loam Castings.

HYDRAULIC WORK.

Lamp Posts, Valves, Etc.

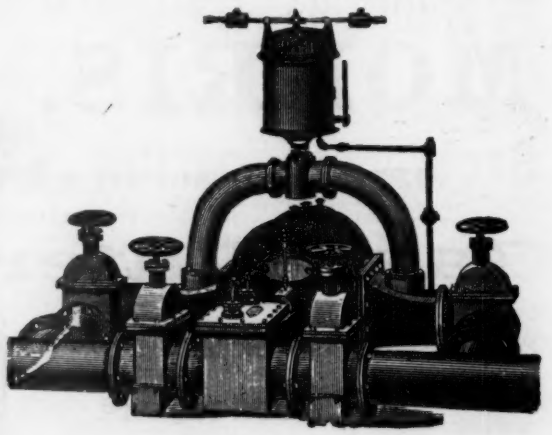
SMITH & SAYRE MFG. COMPANY,

G. G. PORTER, Prest. *245 Broadway, N. Y.* CHAS. W. ISBELL, Sec'y.

Machinery & Apparatus for Gas Works

Drawings, Plans, and Estimates Furnished for the Improvement, Extension, or Alteration of Gas Works, or for the Construction of New Works.

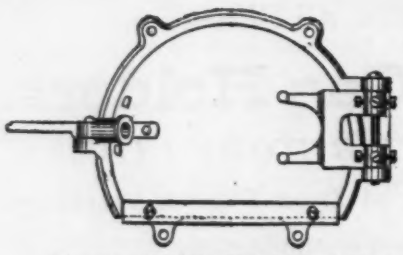
Mackenzie's Patent Rotary and Steam Jet Gas Exhausters, Governors, Compensators, Condensers, Washers, Scrubbers. Isbell's Patent Automatic Street Pressure Governor, Gas and Water Valves, Hydraulic Main Dip Regulator, Bench Castings, etc. Purifying Boxes and "Standard" Scrubbers, Isbell's Patent Self-Sealing Retort Doors.



THE BRENNER SELF-SEALING RETORT DOOR.

Simple, Strong, and Durable.

CLOSES ABSOLUTELY TIGHT & IS LOCKED BY A CAM LEVER. ALL NECESSARY ADJUSTMENT FOR WEAR PROVIDED.



Brenner Self-Sealing Retort Door.

BUILT BY

SMITH & SAYRE MFG. CO.,

No. 245 Broadway, - - - - New York City.

WILLIAM B. LUNDIE, Superintendent of the 42d Street Station of the Consolidated Gas Company, of New York, writes, under date of Jan. 4, 1889:

"We have 320 Brenner Self-Sealing Lids in use at this Station, built by the Smith & Sayre Mfg. Co. They require very little attention, and are the best of the kind that I have seen, giving entire satisfaction."

GAS WORKS APPARATUS AND CONSTRUCTION. GAS WORKS APPARATUS AND CONSTRUCTION.

JAMES R. FLOYD & SONS,

(SUCCESSORS TO HERRING & FLOYD)

Oregon Iron Works,

W. 20th & 21st. Sts., bet. 10th & 11th Avs.,

NEW YORK CITY.

Engineers and Contractors

FOR THE

CONSTRUCTION OF GAS WORKS.

MANUFACTURERS OF

All Kinds of Castings and General Ironwork

FOR

GAS APPARATUS.

Bench Castings, Regenerative and Half Regenerative Furnace Castings.

Condensers, Scrubbers, Purifiers, Street Drips and Connections,

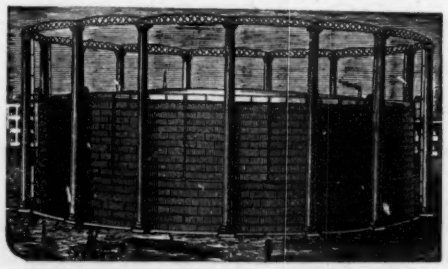
Valves,

Hydraulic Hoisting Purifier Carriage, Self-Sealing Retort Lids, Improved Valve Stand and Indicator, Seller's Cement.

Plans, Specifications, and Estimates furnished for Construction of New or Alteration of Old Works.

CONTINENTAL IRON WORKS.

THOS. F. ROWLAND, Prest. WARREN E. HILL and CHAS. H. CORBETT, V-Prests. THOS. F. ROWLAND, JR., Sec. & Tr



P. O. Station G., BROOKLYN, N. Y.

ENGINEERS AND MANUFACTURERS OF

Gas Holders

CONDENSERS, SCRUBBERS, VALVES,

PURIFIERS, SELF-SEALING RETORT LIDS

Hydraulic Mains,

And all other articles connected with the manufacture and distribution of Gas.

H. RANSHAW, Prest. & Mangr. WM. STACEY, Vice-Prest. T. H. BIRCH, Asst. Mangr. R. J. TARVIN, Sec. & Treas.

STACEY MFG. CO.,

MANUFACTURERS OF

Single and Telescopic Gasholders,

IRON ROOFS, BRIDGES, LAMP POSTS,

Water and Oil Tanks, Coal Elevator Cars,

COKE CRUSHERS, BENCH CASTINGS,

And all kinds of Wrought and Cast Iron Work used in the erection of Coal and Oil Gas Works Rolling Mill Machinery and Heavy Castings a Specialty.

Foundry: 33, 35, 37 & 39 Mill Street. **Wrought Iron Works:** 16, 18, 20, 22, 24 & 26 Ramsey Street.

Cincinnati, Ohio.

Bouton Foundry Co.,

FOUNDERS AND MACHINISTS,

CHICAGO, ILL.

Gas Works Apparatus,

PURIFIERS, CONDENSERS,

Bench Work

SPECIALS, LAMP POSTS,

SCRUBBERS,

Iron Roofs and Floors.

Plans and Estimates furnished for new works or extensions of old works.

1842. **DEILY & FOWLER,** 1889.

Laurel Iron Works.

Address, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

GASHOLDERS,

Single and Telescopic.

Holders Built 1884 to 1888, Inclusive:

Newport, R. I.	Long Island City, N. Y.	Port Chester, N. Y.	Malden, Mass.	West Chester, Pa. (2d
Portland, Oregon.	Macon, Ga.	New Rochelle, N. Y.	Paducah, Ky.	Lancaster, Pa. (3d)
Allegheny, Pa. (2d.)	York, Pa.	Salem, N. J. (3d)	Norwich, Conn.	Tacony, Pa. (two)
Atlanta, Ga. (2d.)	Chester, Pa.	Omaha, Neb. (2d)	Seattle, W. T.	Mount Vernon, N. Y.
N.Y.City (Central Gas Co)	Hazleton, Pa. (2d.)	Lynn, Mass. (3d)	San Diego, Cal.	Binghamton, N. Y.
Lynchburg, Va. (2d.)	Staten Island, N. Y.	Little Rock, Ark.	Northern Gas Lt. Co., of	Concord, N. H.
Saylesville, R. I.	Saugerties, N. Y.	Irvington, N. Y.	New York. N. Y.	Dover, Del. (2d)
Rondout, N. Y.	Clinton, Mass. (Lan. Mills)	South Boston, Mass.	Westerly, R. I.	Calais, Me.
Atlantic City, N. J.	Chattanooga, Tenn.	Rye, N. Y. (2)	Willimantic, Conn	New London, Conn. (2d)
Augusta, Ga.	Galveston, Texas. (3d.)	Woodstock, Ont.	Montclair, N. J.	West Chester, N. Y.
Waltham, Mass. (2)	Omaha, Neb.	Malden, Mass.	Attleboro, Mass.	Bay Shore, L. I.
Mahanoy City, Pa.	Fort Plain, N. Y.	Staten Island, N. Y. (2d)	Santa Cruz, Cal.	Washington, D. C.
New Castle, Pa.	Brunswick, Ga.	Woodstock, Ont.	Erie, Pa. (2d)	

WM. HENRY WHITE,

No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

Erection and Extension of Gas, Water, and Electric Light Works.

SOLE REPRESENTATIVE OF THE

McILHENNY REGENERATOR FURNACE PATENTS

And the Martin Water Gas Process.

Edison Incandescent and American Arc Electric Light Plants Installed.

Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited. Plans and Estimates Furnished.

GAS COALS. CANNEL COALS. GAS ENRICHERS.

JAMES D. PERKINS. **PERKINS & CO.,** F. SEAVERNS.

228 & 229 Produce Exchange, New York.

Cable Address, "PERKINS, NEW YORK" Post Office Box 3695, New York.

GENERAL SALES AGENTS FOR

The Youghiogheny River Coal Company's

OCEAN MINE YOUGHIOGHENY GAS COAL.

HON. W. L. SCOTT, Prest. M. H. TAYLOR, Vice-Prest.

This Colliery is located at SCOTT HAVEN, PA., in the center of the Youghiogheny Gas Coal District, and produces the ONLY RELIABLE YOUGHIOGHENY COAL for gas purposes. (See Map on p. 87 of this JOURNAL, Feb. 16, '85.)

POINTS OF SHIPMENT,

Locust Point, BALTIMORE. Pier No. 62, PHILADELPHIA.

Also, SOLE AGENTS for the

BRECKENRIDGE CANNEL,

OF KENTUCKY.

Within the past two years we have delivered this Cannel to over ONE HUNDRED COMPANIES IN THIRTY-THREE DIFFERENT STATES, and it is now in use in some of the large Gas Works

On the Continent and in South America,

where it successfully competes with the Australian Shale. It is the ONLY AMERICAN GAS CANNEL of sufficiently high grade to warrant EXPORTATION TO EUROPE AND SOUTH AMERICA, and it is the only economical substitute for OIL OR NAPHTHA. ONE GROSS TON will produce

10,000 Cubic Feet of 75 Candle Gas,
or 12,500 " " 60 " "
or 15,000 " " 50 " "
} equal to { 750,000 Candle Feet of Gas, and 26 Bushels of merchantable Coke weighing 900 Pounds

This is the ONLY GAS CANNEL that will produce a REALLY MERCHANTABLE COKE. It can be delivered in parcels of one carload or more to any point in the United States or Canada. Cargo shipments of any size required can be made from NEW YORK, PHILADELPHIA, BALTIMORE, or NEWPORT NEWS. Samples will be sent and particulars of price, etc., forwarded upon application to above address.

JAMES & WILLIAM WOOD,

Gas and Cannel Coal Contractors,

No. 40 St. Enoch Sq., Glasgow. No. 2 Talbot Court, London.

Proprietors of the BATHVILLE COLLIERIES (which produce the celebrated BOGHEAD CANNEL), Shields, Shieldmuir, Drumpeller, and other Collieries. This Firm offer

STANDARD CANNELS,

Unequaled as Gas Enrichers.

Also, WEST FAIRMONT GAS COAL, of W. Va.

Analyses, prices, and all further information furnished on application to

Agency for U.S., Room 93, Nos. 2 & 4 Stone St., N.Y. City.

The Standard Oil Company,

REFINERS OF

NAPTHA AND GASOLINES.

ALSO MANUFACTURERS OF

A Special Grade of Naptha for Gas Companies

FOR ENRICHING COAL GAS.

Correspondence solicited.

No. 43 Euclid Avenue, Cleveland, Ohio.

To Gas Companies.

We make to order CAP BURNERS to burn any amount under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,

248 N 8th Street, Phila., Pa.

COKE CRUSHERS.

Newburgh Orrel Coal and Coke Co.

MINERS AND SHIPPERS OF

STEAM, SMITHING, AND GAS COALS,

Foundry and Crushed Coke.

Home Office, 33 S. Gay Street, Baltimore, Md.

J. HARRY LEE, President.

Shipping Wharves, Locust Point, Baltimore.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

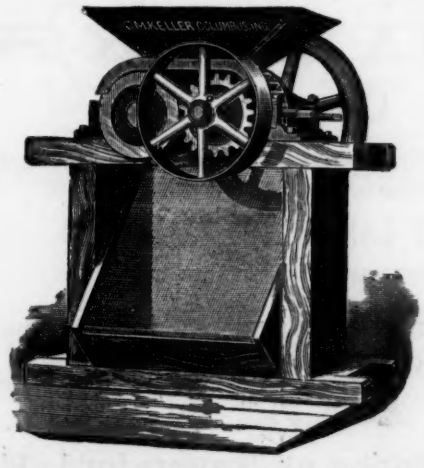
DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, Clarksburg, Harrison Co., W. Va.
WHARVES, Locust Point, Baltimore, Md.
OFFICE, 225 E. German St., " "

ROUSSEL & HICKS, 71 Broadway, N. Y. } *AGENTS.* } BANGS & HORTON, 60 Congress St., Boston.



Keller's Adjustable Coke Crusher

SIMPLE, STRONG, AND DURABLE.

C. M. Keller, Sec. & Supt. Gas Lt. & Coke Co. Columbus, Ind.

Correspondence Solicited.

King's Treatise on Coal Gas.

The most complete work on Coal Gas ever published.

Three Vols. Bound, $30.

BOOKS.

DISTILLATION OF COAL TAR AND AMMONIACAL LIQUOR.

By George Lunge. Price $12.50.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS.

By David A. Graham. 8vo., Cloth. Price $3.

Orders for these books may be sent to this office.

A. M. CALLENDER & CO.,
42 Pine St., N. Y. City

GAS COALS.

GAS COALS.

THE PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened & Prepared for Gas Purposes.

Their Property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

209 SOUTH THIRD STREET, PHILA., PA.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River; Pier No. 1 (Lower Side), South Amboy, N. J.

Chesapeake & Ohio Railway Coal Agency,

FOR THE SALE OF THE

Superior Kanawha Gas Coals, Cannelton Cannel,

Also, SPLINT AND STEAM COALS,

From the Kanawha and New River Regions, on the line of the Chesapeake & Ohio R'way.

C. B. ORCUTT, General Agent, - - No. 1 Broadway (Room 217) New York City.

FRANCIS H. JACKSON, Prest. EDMUND H. MCCULLOUGH, V.-Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Penn.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J.,
WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

The American Gas Engineer and Superintendent's Handbook.

By WILLIAM MOONEY.

Consisting of Rules, Reference Tables, and Original Matter Pertaining to the Manufacture, Manipulation, and Distribution of Illuminating Gas.

350 Pages, Full Gilt Morroco. $3.00.

A. M. CALLENDER & CO., 42 Pine St., N. Y.

GAS METERS. GAS METERS. GAS METERS.

ESTABLISHED 1859.

JOHN J. GRIFFIN & CO.,

Nos. 1513, 1515, 1517, & 1519 Race St., PHILADELPHIA.
No. 52 Dey Street, NEW YORK. No. 75 North Clinton Street, CHICAGO.

Manufacturers of Meters for Measuring Gas

IN ANY VOLUME.

EXPERIMENTAL APPARATUS FOR QUANTITATIVE AND QUALITATIVE ANALYSIS.

Provers, Gauges, Registers, Etc.

Careful and Prompt Attention paid to the Repairing of all kinds of Meters and Apparatus.

Estimates Cheerfully Furnished.

Dry Gas Meters.

With 40 years' experience and the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

NATHANIEL TUFTS,

No. 153 Franklin Street, Boston, Mass.,

MANUFACTURER OF

DRY GAS METERS.

Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges, Pressure and Vacuum Gauges.

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Patent Cluster Lanterns for Street Illumination.

HAROLD J. BELL. # BELL & JONES, S. LEWIS JONES.

No. 12 North Ninth Street, Philadelphia, Pa. Works at Royersford, Pa.

MANUFACTURERS OF

GAS METERS, STATION AND EXPERIMENTAL METERS,

Meter Provers, Pressure Gauges, and All Other Gas Appliances in Our Line.

WE REPAIR ALL KINDS AND MAKES OF METERS, AND THE WORK GUARANTEED.

High Pressure Meters for Natural Gas, in Iron Cases, guaranteed to stand 300 lbs. Pressure. Gas Cooking and Heating Stoves, Hot Plates, Cake Griddles, Waffle Bakers, Boiling Stoves, Laundry and Tailors' Iron Heaters. Hotel and Cafe Ranges a Specialty.

Correspondence Solicited. **Estimates Furnished.**

SCIENTIFIC BOOKS.

All books forwarded by express, upon receipt of price; if sent by mail, postage must be added to price given. We take pains in forwarding any other Works desired. Remittances by check, draft, or P.O. money order.

KING'S TREATISE ON THE MANUFACTURE OF COAL GAS. Three vols; $10 per vol.

GAS MANUFACTURE, by WILLIAM RICHARDS. 4to., with numerous Engravings and Plates, in Cloth binding. $12.

TECHNICAL GAS ANALYSIS. $3.00.

GAS CONSUMER'S GUIDE. $1.

A GUIDE TO GAS LIGHTING. 40 cents.

GAS MEASUREMENT AND GAS METER TESTING, by F. W. HARTLEY. $1.60.

GAS CONSUMER'S HANDBOOK, by WILLIAM RICHARDS, C.E.; 18mo., Sewed. 20 cents.

A PRACTICAL TREATISE ON GAS AND VENTILATION, with Special Relation to Illuminating, Heating, and Cooking by Gas, by E. E. PERKINS. $1.25.

PRACTICAL TREATISE ON HEAT, by THOMAS BOX. Second edition. $5.

COAL; ITS HISTORY AND USE, by PROF. THORPE. $1.50.

THE GAS WORKS OF LONDON, by COLBURN. 60 cents.

THE GAS FITTER'S GUIDE, Showing the Principles and Practice of Lighting with Coal Gas, by JOHN ELDRIDGE. 40 cents.

MUNICIPAL LIGHTING, by F. H. WHIPPLE. $1.

GAS WORKS, AND MANUFACTURING COAL GAS, HUGHES. $2.20.

THE MANAGEMENT OF SMALL GAS WORKS, by C. J. R. HUMPHREYS. $1.

MANUAL FOR GAS ENGINEERING STUDENTS, by D. LEE. 40 cents.

HOW TO MANAGE GAS, by F. WILKINS. Paper. 20 cents.

THE DOMESTIC USES OF COAL GAS, AS APPLIED TO LIGHTING, by W. SUGG. $1.40.

DISTILLATION OF COAL TAR AND AMMONIACAL LIQUOR, by GEO. LUNGE. New Edition. $12.50.

ILLUMINATING AND HEATING GAS, by W. BURNS. $1.50.

A TREATISE ON THE COMPARATIVE COMMERCIAL VALUES OF GAS COALS AND CANNELS, by D. A. GRAHAM. 8vo, Cloth. $3

GAS COMPANIES DIRECTORY. $3.

GAS VERSUS ELECTRIC LIGHT. 50 cents.

THE AMERICAN GAS ENGINEER AND SUPERINTENDENT'S HANDBOOK, by WM. MOONEY. $3.

DIGEST OF GAS LAW. $5.

GAS ENGINE INDICATOR DIAGRAM. by W. E. AYRTON. Paper. 20 cents.

TESTING PIPES AND PIPE JOINTS, by M. M. PATERSON. 80 cents.

DESIGNING WROUGHT AND CAST IRON WORK, by H. ADAMS. Paper. Three parts, 60 cents each.

NOTES IN MECHANICAL ENGINEERING, by H. ADAMS. $1.

STRAINS IN IRONWORK, by H. ADAMS. With plates. $1.75.

GAS WORKS—THEIR ARRANGEMENT, CONSTRUCTION, PLANT, AND MACHINERY. $8.

A. M. CALLENDER & CO., 42 Pine Street, New York.

GAS METERS. GAS METERS. GAS METERS.

GEO. J. McGOURKEY, Prest. WM. H. McFADDEN, Vice-Prest. (Phila.) WM. N. MILSTED, Gen. Supt. and Treas. (New York). WM. H. DOWN, Sec.

THE AMERICAN METER CO.

WET AND DRY GAS METERS. PRESSURE REGISTERS. METER PROVERS.
STATION METERS. PRESSURE & VACUUM REGISTERS. PORTABLE TEST METERS.
EXHAUSTER GOVERNORS. PRESSURE & VACUUM GAUGES. EXPERIMENTAL METERS.
DRY CENTER VALVES. CRESSON GAS REGULATORS. AMMONIA TEST METERS.
GOVERNORS FOR GAS WORKS. MARSLAND WATER METERS. BAR & JET PHOTOMETERS.

Manufactories:
512 West 22d St., N. Y.
Arch & 22d Sts., Phila.

GAS STOVES.
SUGG'S "STANDARD" ARGAND BURNERS,
SUGG'S ILLUMINATING POWER METER,
Wet Meters, with Lizar's "Invariable Measuring" Drum.

Agencies:
177 Elm Street, Cincinnati.
244 & 246 N. Wells Street, Chicago.
810 North Second Street, St. Louis.
222 Sutter Street, San Francisco.

HELME & McILHENNY,

(Established 1848.)

GAS METER MANUFACTURERS,

Nos. 1339 to 1349 Cherry Street, Philadelphia, Pa.,

WET AND DRY GAS METERS, STATION METERS, EXPERIMENTAL METERS, METER PROVERS,

Center Seals, Pressure Registers, Governors, Indicators, Photometers, and all other kinds of Apparatus for use in Gas Works.

FOULIS' PATENT STATION AND DISTRICT GOVERNORS.

REPAIRING DEPARTMENT.—We employ a special force of skilled workmen repairing meters of **all makers.**

WM WALLACE GOODWIN, Prest. and Treas. WM. H. MERRICK, Vice-Prest. S. L. JONES, Sec. S. V MERRICK, Supt.

THE GOODWIN GAS STOVE AND METER CO.,

Successors to W. W. GOODWIN & CO.

1012, 1014 and 1016 Filbert St., Phila., Pa. 142 Chambers St., New York City. 76 Dearborn, St., Chicago, Ills.

WALDO BROTHERS, Agents, 88 Water Streets, Boston, Mass.

MANUFACTURERS OF

DRY AND WET GAS METERS,

Station Meters (square, cylindrical, or in staves), Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, etc., etc. Meter Provers (sizes 2, 5, and 10 feet), Pressure Gauges of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4, 6, and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Center Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete. Also, Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

Manufacturers of the "SUN DIAL" GAS STOVES, for Cooking and Heating.

Goodwin's Improved Lowe's Jet Photometer. **Agents for Bray's Patent Gas Burners and Lanterns.**

Special attention to Repairs of Meters and all Apparatus connected with the business. All work guaranteed first-class in every particular. Orders filled promptly.

G. B. EDWARDS, Manager, New York. S. S. STRATTON, Manager, Chicago.

D. McDONALD & CO.,

GAS METER MANUFACTURERS.

(Established 1854.)

51 Lancaster St., Albany, N. Y. 34 & 36 West Monroe St., Chicago, Ill.

STATION METERS, EXPERIMENTAL METERS, METER PROVERS, PRESSURE & VACUUM REGISTERS, PRESSURE GAUGES, ETC

Also STAR GAS STOVES, RANGES, and HEATING STOVES.

We use only the very best materials, and employ the most skilled labor, and by our long experience (32 years) and personal supervision of every detail, we feel justified in assuring the public that our goods will give perfect satisfaction. Every Meter emanating from our establishment will bear the State Inspector's Badge, and will be fully warranted by us. Our Annual and Calendar will be sent to Gas Companies upon application.

GAS INTO POWER,

BY THE

OTTO GAS ENGINE.

GAS POWER.—A Source of Revenue to Gas Companies ready to engage in Electric Lighting, building of Water Works, Electric Street Railways, etc.

Coal for producing Gas is less in amount than that for producing Steam, both being measured on an equal amount of work performed. And, further, with Gas,

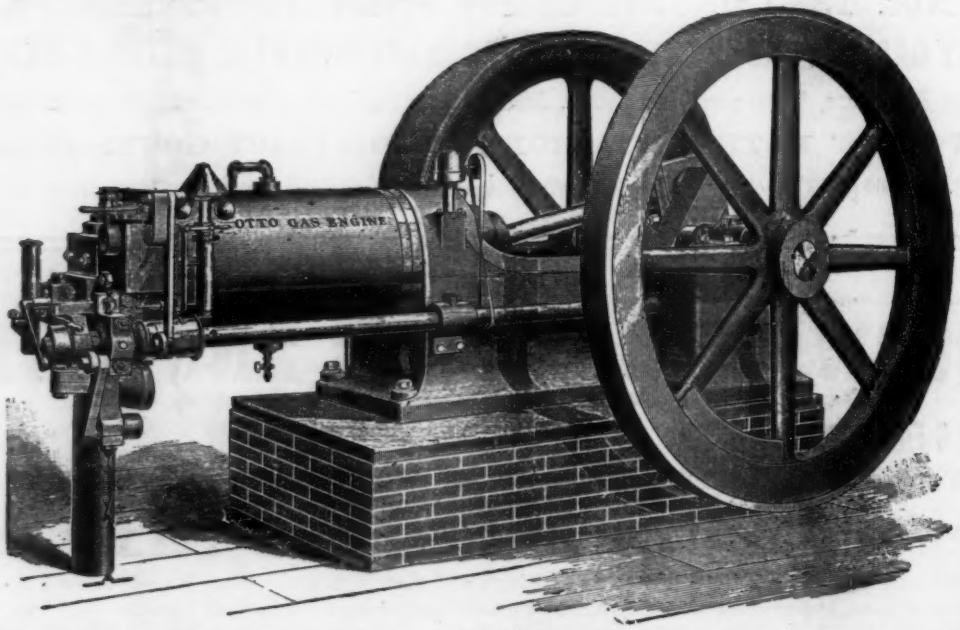
50 to 90 per Cent. of Value of Coal is Returned

by sale of Coke and Tar, according to the market value of these products.

Labor for handling fuel is **reduced,** by its becoming centralized and confined to the gas house, and frequently has not increased after the addition of a power station.

With Gas Power, **cost of fuel** is strictly **limited** to the time of use.

MANY VALUABLE AND RECENT IMPROVEMENTS.



SIZES, 1-3 to 100 HORSE POWER.

Wherever Gas Companies tried Gas Power with Steam Power together in one Station, the use of Steam was subsequently abandoned or restricted, and Gas Power made to take its place.

Where Gas Companies adopt Gas Power for Electric Plants, Water Works, Sewerage, etc., they not only choose **the most economical power for their use,** but secure to themselves the **numerous advantages of increased production,** without increase of expense, and benefit thereby their entire manufacture. They induce consumers, by their example, to abandon Steam for Gas Power, and, by establishing special rates, make

Gas Power the Leading Power of To-Day,

AND SOLVE AT ONCE THE QUESTION OF FUEL GAS.

"Otto Gas Engine Works,"

SCHLEICHER, SCHUMM & CO.,

151 Monroe St. (Kent Building), Chicago. **33d and Walnut Sts., Phila,**

NEW YORK AGENCY, 18 VESEY STREET.